B. Sc. Microbiology (Colleges-revised) 2007-08

REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and
COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY
with Semester System
(with effect from 2007-2008)

1. Eligibility for Admission to the Course
Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. Duration of the Course
The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. Course of Study
The course of study for the UG degree courses of all branches shall consist of the following

a) Part - I
Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

The subject shall be offered during the first four semesters with one examination at the end of each semester.

b) Part – II : English
The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

c) Foundation Course
The Foundation course shall comprise of two stages as follows:
Foundation Course A : General Awareness (I & II semesters)
Foundation Course B : Environmental Studies (III & IV semesters)

The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
From the printed material supplied by the University - 75%
Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) **Part – III**

**Group A:** Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

**Group B:** allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C:** application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D:** field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

- A-Exemplary
- B-very good
- C-good
- D-fair
- E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

a) A candidate will be permitted to appear for the university examinations for any semester if
i) He/she secures not less than 75% of attendance in the number of working days during the semester.

ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and

iii) His/her conduct has been satisfactory.

Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

(ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

(iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**

No candidate shall be eligible for conferment of the Degree unless he / she,

i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.

ii. Has satisfactory participate in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.

iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**

A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10 % of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.

The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**

Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for Part III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-.

14. **Evening College**

The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**

The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**

The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**

Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
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* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II  
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I  

UNIT – II  

UNIT – III  
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV  
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V  

References
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount – LCB- Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro-organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT - III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT -III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
SEMESTER IV

GRA CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER - V

CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER - V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT - IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radioimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT – V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER – V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV

Fermented food – pickled cucumber, saurkraut, soysauce, Bread, Idli – Fermented dairy products – Yoghurt and cheese.

UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, -RAPD and Application,-Microarray.

References
UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplasmic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT - IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A.B).
Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References

SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of
epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
*Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis,
Corynebacterium dipheriae*.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive
Organisms- *Clostridium perfringens, Clostridium tetani*.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative
organisms *Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella,
Pseudomonas, Vibrio cholerae*.

UNIT -V
Morphology, pathogenicity and laboratory diagnosis- *Mycobacterium
Tuberculosi, Mycobacterium lepra, Treponema pallidum, Leptospira,
Chlamydas, Rickettsiae*.

References
1. Mackie and Mc catney, 1994, Medical Microbiology No I and II. Churchill
   Livingston, 14th edition.
   Longman.
   Calcutta.
   Mosby Publications.
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange
   Medical Publications, USA
SEMMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT - I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT - III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT - IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT - V

References
SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization - Demonstration
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia.*
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, Widal), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References

SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology – Collection and transport of clinical specimens – Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODELL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs
Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1) Who is called as "Father of Microbiology"?
   a) Robert koch   b) Louis Pasteur   c) Antony Von Leewenhock   d) Both b & c
2) Immunity mediated by antibodies are called as ________________
   a) Humoral   b) Cell mediated   c) Active   c) Passive
3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.
4) ___________ is used as a counter stain in spare staining
   a) Safranin   b) Methylene blue   c) Malachite green   d) Crystal violet
5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP   b) TDT   c) D   d) None of the above.
6) HEPA filters can remove particles of size ________________
   a) 0.2 um   b) 0.3 um   c) 0.4 um   d) 0.5 um
7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms   b) Anaerobic organisms   c) Facultative anaerobic organisms   d) Microphilic organisms
8) _______________ is an example for selective media.
   a) Mac conkey agar   b) EMB agar   c) Both a & b   d) None of the above.
9) TVC refers to ________________
   a) Total viable count   b) Total viral count   c) Total viable colony   c) None of the above.
10) _______________ is an example for short term preservation of microbes.
    a) Agar slant   b) Agar slant   c) Mineral oil overlay   d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.
11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theroy of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.
12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.
13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.
14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.
15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - AnswerALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discus the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II -MICROBIAL DIVERSITY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain  (b) Genus  (c) Species  (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram  (b) Similarity matrix  (c) Dendrogram  (d) None of the above
3. Which of the following is a motile bacterium
   (a) Esherichia coli  (b) Klebsiella  (c) Bacillus subtilis  (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall  (b) Colonies have fried egg appearance  (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast  (b) Plastid  (c)Thylakoid  (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens  (b) Halophiles  (c) Thermophiles  (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores  (b)Zygospores  (c) Basidiospores  (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores  (b)Zygospores  (c) Conidiospores  (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae  (b) Green algae  (c) Blue green algae  (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall  (b) Move by flagella/pseudopodia
    (c) Unicellular  (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples
14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of Bergeys manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY
Duration – 3hrs Maximum – 100 Marks
SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds
2. Polarly flagellated bacteria is known as --------------
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Poly phosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
   Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
(a) Water  (b) Pigments  (c) Light  (d) H2S
2. *Thiobacillus thiooxidans* is an example of---------
(a) Chemoautotrophs  (b) Heterotrophs  (c) Photoautotrophs  d) Copiotrophs
3. The organisms which tolerate high pressure are called
(a) Halotolerant  (b) Barotolerant  (c) Psychrophilic  (d) Thermotolerant
4. Chemostat is associated with
(a) Synchronous culture  (b) Batch culture  (c) Continous culture  (d) Diauxic growth
5. All the following are intermediates of TCA cycle except
(a) Citric acid  (b) Fumaric acid  (c) Lactic acid  Insertion  (d) Ketoglutaric acid
6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
(a) EMP  (b) ED  (c) HMP  (d) TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
(a) Sulphur compound  (b) Oxygen  (c) Nitrogenous compound  (d) Carbondioxide
8. Which of the following carries out mixed acid fermentation?
(a) *Saccharomycyes cerevisiae*  (b) *Chlorella* sp  (c) *Klebsiella* sp  (d) *Escherichia coli*
9. Which of the following is the electron donor in anoxygenic photosynthesis?
(a) Water  (b) Sunlight  (c) H2S  (d) O2
10. The carrier molecule in cell-wall biosynthesis is a----
(a) Lipid  (b) Carbohydrate  (c) Protein  (d) None of the above

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria.  Or
(b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth.  Or
(b) Give an account on Diauxic growth.
13. (a) Giving suitable example , describe substrate level phosphorylation.  Or
(b) Describe ED pathway.
14. (a) Describe alcoholic fermentation.  Or
(b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a) What is anoxygenic photosynthesis? Describe.  Or
(b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - AnswerALLQuestions.

16. (a) With neat diagram , describe the event of endospore formation in bacteria.  Or
(b) With suitable examples , classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth..  Or
(b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
(b) What is oxidative phosphorylation? Describe.

19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.

20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
(b) Describe the C3 pathway of Co2 fixation.

**CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A (10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization  
   b. moist air sterilization  
   c. membrane filtr  
   d. chemical sterilization.

2. Moist heat sterilization is achieved by
   a. lyophilization  
   b. incineration  
   c. autoclave  
   d. oven.

3. Lyophilization is the
   a. separation of proteins  
   b. sudden freezing and dehydration  
   c. enzyme reaction by oxidation  
   d. high pressure–segmentation.

4. The pH is defined as
   a. logH+  
   b. log2H+  
   c. -logH+  
   d. -log2H+

5. Which is used as an absorbent in TLC.
   a. KCl solution  
   b. lead sulphate  
   c. anions  
   d. silica gel

6. SDS-PAGE is used to separate
   a. nucleic acid  
   b. lipid  
   c. protein  
   d. carbohydrate.

7. UV light is significantly absorbed by
   a. coloured solution  
   b. nucleic acid  
   c. proteins  
   d. enzymes.

8. NPK analysis is done using
   a. electrophoresis  
   b. centrifugation.  
   c. flame photo  
   d. chromatography.

9. The pH of the blood is
   a. 6.3  
   b. 7.4  
   c. 7.0  
   d. 7.6

10. What is the normality of 5M NaOH solution?

**SECTION-B(5X6=30Marks) - Answer ALL Questions.**

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)

11.b. Explain the working of an incubator.

12.a. Explain the electrodes used in pH measurement. (or)

12.b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.

13.a. What is paper chromatography? (or)

13.b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
   b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml/g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)

   b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge. (or)
   b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
   b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
   b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
   b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology.
   with their applications (or)
   b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------ to prove that the RNA also act as genetic material
   a) TMV       b) Retrovirus   c) Pox       d) Bacteriophage
2) Which form of DNA is prevalent in living cells?
   a) A       b) B     c) C     d) Z
3) -------------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase    b) helicase    c)polymerase    d) primase
4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad b) Tautam &Lederberg c) Meselson &stahl   d) Hershey & Chase
5) ------------ no of codons constitute the coding dictionary
   a) 64       b) 61       c) 62       d) 60
6) CAP is involved in-------------?
   a) Catabolic repression  b) Induction c) feed back inhibition  d) None of these
7) ----------is an example for intercalating agent?
   a) Acridine orange  b) EMS  c) Nitrous oxide    d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair d) all of the above
9) Davis-u-tube expt is used to prove the existance of--------?
   a) Transformation  b) conjugation  c) transduction d0 recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA  OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment  OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code  OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test  OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction  OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?  OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli  OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?  OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene  OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock   b) Robert Koch   c) Louis Pasteur   d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis   b) Hematopoiesis   c) Hemoglobin   d) None of the above.

3) _______________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody   b) Haptens   c) Adjuvants   d) Epitopes

4) ____________________ is the immunoglobulin which can cross the placenta.
   a) IgA   b) IgD   c) IgM   d) IgG

5) Type I hypersensitivity is otherwise called as _________________
   a) Cell Stimulating   b) Delayed type   c) Anaphylactic   d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator   b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator   d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin   b) Agglutinin   c) Agglutinogen   d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand   b) Analyte   c) Both a & b   d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ____________
   a) Allografts   b) Autograft   c) Isograft   d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ____________
    a) Adoptive immunisation   b) Adaptive immunisation   c) Combined   d) None of the above.

SECTION – B (5X6 = 30 Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C (5X12 = 60 Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
    b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
    b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time
   combination of
   (a) 62.8°C, 30 min  (b) 62.5°C, 30 min  (c) 71.7°C, 15 sec  (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus  (b) Bacillus  (c) Saccharomyces  (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer  (b) sauerkraut  (c) soft drinks  (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather  (b) springer  (c) flipper  (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce  (b) yoghurt  (c) bread  (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides  (b) Streptococcus faecalis
      (c) Pediococcus cerevisiae  (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample  (b) storage of sample at room temperature for 24 hr
      (c) gathering information  (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin  (b) a neurotoxin  (c) a hepatotoxin  (d) a nephrotoxin.

SECTION-B (5X6 = 30 Marks) - Answer ALL Questions.
11a) What is the significance of molds in food microbiology? Describe. (or)
    b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful
       effects.
12a) Discuss the drying process as a method of food preservation. (or)
    b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
    b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
    b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.
19a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI  (b) EcoRI  (c) HindIII  (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase  (b) E.coli ligase  (c) Sal ligase  (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA  (b) Protein  (c) Phosphatase  (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosomal  (b) Double stranded  (c) Self replicating  (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  (c)M13 Phage  (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi.
7. Colony hybridization technique is employed for
   (a)Selection of vector  (b)Unhybridised ones  (c)Selection of desirable clones  (d)None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation  (b) Microinjection  (c) Transformation  (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus  (b) Thermus aquaticus  (c) Thermobacter aquaticus(d) Thermus aquatica
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot  (b) Northern blot  (c) Western blot  (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or
(b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or
(b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or
(b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or
(b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or
(b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or
(b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or
(b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
(b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
(b) How will you identify the presence of r DNA in a cell?.
20. (a) Explain Southern blotting technique and its applications. Or
(b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs  aximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) ----------- are broad spectrum antiviral products
   a) Histones   b)IFN   c) Streptomycin   d)Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida   b) Xanthomonas campestris   c)Xanthococcus   d) Zymomonas
3) ----------- is involved in the fusion of myloma cells with spleen cells
   a) PEG   b)PGA   c) IPTG   d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as -----------
   a) Subunit   b) Whole cell   c) Antiidiotype   d) Peptide
5) ----------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes   b) Right border   c) Left border   d) IAA
6) Nopaline is -----------
   a) Unusual Amino acid   b) Nucleotide   c) Vitamin   d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey   b) Snake    c)Dinosaurs   d) Mice
8) __________ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) __________ marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION – B (5X5 = 25 Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
   d) List the uses of Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application and development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development - explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8 = 40 Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application (or)
    b) Discuss about transgenic - goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs     Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in __________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a _______________
   a. open culture system  b. system that maintains constant cell conc.
   c. system with addition of nutrients  d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product  b. Vitamin B12 as a by product
   c. Vitamin C as a by product  d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag  b. log  c. stationary  d. decline
7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore  b. Massachusetts Institute of technology
   c. MTCC  d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol  b. methane  c. oil  d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery  b. quality control  c. sterilization  d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid  b. amino acid  c. both  d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**

11.a. Discuss the significance of microbes in the production of commercially important products.
     (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture  (or)
     b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.  (or)
     b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making  (or)
     b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.  (or)
     b. Write short notes on batch filters that are employed in down stream processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**

16.a. Give a detailed account on the various methods of strain improvement  (or)
     b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.  (or)
     b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.  (or)
     b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.  (or)
     b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.  (or)
     b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is  
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) -------------- is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an an example for -------------- degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) -------------- is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as ----------- in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability -------------- number of E.coli can present in 100 ml of water
   a) 1  b) 0  c) 10  d) 100

9) Application of alum is in ---------- phase of water treatment

10) Super Bug was developed and patented by ----------
    a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION – C (5X12=60Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV? (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) M. Theiler
2. The spikes are otherwise (a) Peplomers (b) Capsid (c) Envelope (d) Coat
3. The one step growth experiment was developed by (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is (a) T4 phage (b) MS2 (c) QB (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called (a) Conduction (b) Transfection (c) Insertion (d) Induction
6. The int gene codes for the synthesis of an ------------ enzyme (a) Integrase (b) Ligase (c) Excisionase (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA (b) Infectious ss RNA (c) Non – infectious ss DNA (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through (a) Endodesmata (b) Pore (c) Echodesmata (d) None of the above
9. In herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane (b) cytoplasm (c) Nucleus (d) None of the above
10. For measles, the immunogen is (a) Active but attenuated (b) Inactive but attenuated (c) Inactive heat killed (d) Inactivated

SECTION-B (5X6 = 30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or (b) Give a brief outline on Rubella virus.

SECTION-C (5X12 = 60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenecity and laboratory diagnosis of Hepatitis B virus. Or (b) Explain the pathogenecity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs

Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease
   a. Malaria     b. filariasis   c. plaque   d. all the above

2. Persons with symptomless infection is called
   a. immuned       b. carrier   c. vector   d. resistant

3. The commonest cause of localized suppurative lesion in man is
   a. streptococci   b. staphylococci  c. Pseudomonas  d. Vibrio

4. Toxigenecity of C.diphtheriae is determined by

5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus   b. Corynebacterium  c. Clostridium  d. Mycobacterium

6. Clostridium tetani is the causative agent of
   a. anthrax disease   b. lock jaw   c. hepatitis   d. rabies

7. Food borne intoxication is caused by
   a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus

8. Darting motility is seen with
   a. E.coli   b. Streptococcus   c. V.cholerae   d. S.typhi

9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar   b. BSA   c. LJ   d. TCBS

10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces   b. urine  c. sputum   d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers. (or)
      b. State Koch postulates.

12.a. Give the features of Streptococcus. (or)
      b. Give the features of B.anthracis

13.a. Describe the methods for diagnosis to tetanus (or)
      b. Describe the methods for diagnosis of gas gangrene.

14.a. Write a short note on enteric fever. (or)
      b. Write a short note on bacillary dysentery.

15.a. Give the features of Chlamidiae. (or)
      b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples. (or)
      b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.

17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
      b. Give an account of Staphylococcus aureus its morphology and diagnosis.

18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
      b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.

19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
      b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.

20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
      b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLYING ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs  
Maximum – 75 Marks

SECTION A (10 x 1=10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as _______________
   a) Hypha       b) Mycelium       c) Mould        d) Fungi

2. _______________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci b) P. notatum c) Rhizopus      d) Mucor

3. Candidosis is caused mainly by ____________
   a) C. albicans       b) C. tropicalis c) C. pseudotropicalis d) C. krusei

4. The major organism which causes urinary tract infection is ______________
   a) E. coli      b) Salmonella  c) Shigella    d) Klebsiella

5. Traveller's diarrhea is caused by ___________
   a) Enteropathogenic E. coli       b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli        d) Enterotoxigenic E.coli

6. Blue pus is caused by _______ a) Pseudomonas b) Vibrio c) Salmonella d) E. Coli

7. Sexually transmitted disease is caused by __________
   a) Treponema b) Klebsiella c) Proteus       d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as __________
   a) Septicemia    b) bacteremia   c) Viremia    d) Algemia

9. MIC denotes _______________
   a) Maximum inhibitory concentration     b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration    d) None of the above

10. Endoflagella is a characteristic nature present in ____________
    a) Spirochetes b) Salmonella c) Proteus     d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
     b) Describe candidiasis

12. a) Comment on Taenia solium (or) b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
     b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or) b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance (or)
     b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or)
     b) Aspergillosis Describe.

17. a) Describe *Trichus trichura* (or)
     b) Comment on *Wucheraria bancrofti*

18. a) Describe the etiology and lab diagnosis of diarrheagenic *E.Coli* (or)
     b) Comment on pyogenic infections caused by *Staphylococcus*.

19. a) Comment on meningitis (or) b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
     b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients’ blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
   a) Culturing on LJ medium
   b) Acid fast staining
   c) Animal susceptibility
   d) Fluorescent Microscopy.

SECTION B (5X6=30 Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections? (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method? (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine  c) Urine form catheter bag  d) Early morning urine sample

2. All the following are acid fast except,
   a) *Mycobacterium*  b) *Actinomyces*  c) *Nocardia*  d) *Staphylococci*

3. The common medium used for growing *M tuberculosis* is
   a) Blood agar b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Klebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*

5. Selective medium for *Staphylococci* is a) EMB agar b) BSA c) MSA d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm

7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion  
   c) have circulating anti A and B antibodies  d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None

10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.
11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.
12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.
13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.
14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.
15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.
17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.
18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity.(OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.
19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.
20. a) What information is essential for the design of a pathogen specific nucleotide probe?
   Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Growth medium for fungus inhibits growth of
   a) Bacteria b) Protozoa c) Virus d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus b) Candida c) Saccharomyces d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium b) Taenia saginata c) Taenia corporis d) Taenia pedis
5. Of the following organisms, which has a bigger size?
6. Hookworm infection is by
   a) Ingestion of embryonated eggs b) Larvae penetrating through the skin
   c) Ingestion of larvae d) the bite of insects
7. Viruses can be cultivated in
   a) Nutrient agar b) Cell culture c) Corn meal agar d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA b) IHA c) Immunoelectrophoresis d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg b) HBsAg + HBcAg c) HBsAg + Core antibody d) HBcAg
10. Viruses are
    a) Found primarily in soil    b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar d) Can be seen in bright field microscope.

SECTION B (5X6 = 30 Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infection and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION—C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing.(OR)
   b) Name the specimen collected for dennatophytooses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male?(OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Piasmodium*. (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis.(OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY with Semester System (with effect from 2007-2008)

1. **Eligibility for Admission to the Course**
   
   Candidate for admission to the first year of the **B.Sc., Microbiology** degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology / Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   
   The course of study for the UG degree courses of all branches shall consist of the following:

   a) **Part - I**
      
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A:** Core subject – As prescribed in the scheme of examination. Examination will be conducted in the core subjects at the end of every semester

**Group B:** allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C:** application oriented subjects: 2 subjects – 4 papers
The application –oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D:** field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary  
B-very good  
C-good  
D-fair  
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

   a) A candidate will be permitted to appear for the university examinations for any semester if

      i) He/she secures not less than 75% of attendance in the number of working days during the semester.

      ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and

      iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**
   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**
   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**
   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed the whole examination.

9. **Improvement of Marks in the subjects already passed**
   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**
    a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

    b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

    (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

    (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**

   No candidate shall be eligible for conferment of the Degree unless he/she,
   
i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**

   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**

   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-.

14. **Evening College**

   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**

   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**

   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**

   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
### SCHEME OF EXAMINATIONS

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*NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I  
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_),Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique-- Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour,Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) - General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave , Hot air oven , Incubator , Water Bath , Laminar air flow , BOD incubator, Centrifuges – Bench top , High sped , Ultra centrifuge.

UNIT – II

pH meter , Conductivity meter, Lyophilizer , McIntosh anaerobic jar , Biosensor, Metabolic shaker.

UNIT -III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2.Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
**SEMESTER IV**

**GRA CORE PRACTICAL II**

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

**SEMESTER -V**

**CORE PAPER VI - MICROBIAL GENETICS**

**UNIT-I**
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

**UNIT-II**
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment – mechanism & enzymology of replication – theta replication & rolling circle replication.

**UNIT-III**

**UNIT-IV**
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

**UNIT-V**
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

**References**

2. Freifelder, S., 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER – V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT - IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants - Direct Method – Selection by Complementation, Marker inactivation Methods , -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application,-Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products - Proteins - Pharmaceuticals – Interferons - Human growth hormone - Antibiotics - Biopolymers.

UNIT –II

Vaccines – subunit vaccines – Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants - Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER - VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT - I

Industrially important strains- Screening methods- Strain development for
Improved yield- Mutation, Recombination and protoplasmic fusion.

UNIT - II

Fermentation- submerged and solid state- component parts of a CSTR- types of
Fermentors (Tower, clyndroconical & airlift) – batch fermentation – continuous
Fermentation.

UNIT - III

Production of beverages – beer and wine- vitamin B12 and Riboflavin –
Antibiotics- penicillin and streptomycin- production of enzymes- Amylases and
Proteases- methods of immobilization.

UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development-
Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT - V

Downstream process- Intercellular and extracellular- Centrifugation, filtration,
Floatation- solvent extraction, precipitation- Breakage of cells- physical and
Chemical methods.

References

Press. NY


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammonialism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnososis of Hepatitis (A.B). Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II.

References


SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of
epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis,
Corynebacterium diptheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive
Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative
organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella,
Pseudomonas, Vibrio cholerae.

UNIT- V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium
Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira,
Chlamydia, Rickettsiae.

References
1. Mackie and Mc catney, 1994, Medical Microbiology No I and II. Churchill
Livingston, 14th edition.
Longman.
Calcutta.
Mosby Publications.
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange
Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT - I

UNIT - II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT - III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT - IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT - V

References
# SEMESTER VI
## GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli*, *Klebsiella pneumoniae*, *Proteus*, *Salmonella*, *Shigella*, *Pseudomonas*, *Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans*, *Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus*, *Mucor*, *Penicillium*, *Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba*, *Plasmodium*, *Ascaris*, *Taenia*.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT –IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I
Selection, collection and transport of specimens – Blood, Urine, Sputum, CSF, Pus & Faeces –
transport media and storage. Microscopic examination of specimen for Bacterial pathogens –
simple, differential staining and motility.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment
and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment
and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and
interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL),
Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion,
Immunoelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Aplications of Nucleic acid
hybridization, PCR and blotting in diagnosis.

References
Company.
Hyderabad.
3. Medical laboratory manual for tropical countries. Microbiology by Monica chees brough
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY – II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT – I
Laboratory methods in basic Mycology – Collection and transport of clinical specimens – Direct
Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal
susceptibility testing

UNIT – II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal
and urino-genital specimen.

UNIT – III
Identification of Intestinal Protozoa – Amoeba, Blood protozoa – Malaria, Intestinal Helminthes
and Blood Helminthes.

UNIT – IV
Laboratory methods in basic virology - detection of viral antigen (fluorescent antibody and
solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT – V
Viral culture- Media and cells used – Specimen processing – isolation and identification of
viruses.

References
Hyderabad.
Ltd. Kolkata.
5. Textbook of Medical Parasitology, Subash O. Barija, 1996. First edition. All India
Publishers and Distributors Regd. 920 Poonamallee High Road, Chennai.
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs  Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1) Who is called as "Father of Microbiology"?
   a) Robert koch  b) Louis Pasteur  c) Antony Von Leewenhock  d) Both b & c
2) Immunity mediated by antibodies are called as ________________
   a) Humoral  b) Cell mediated  c) Active  c) Passive
3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.
4) ___________ is used as a counter stain in spare staining
   a) Safranin  b) Methylene blue  c) Malachite green  d) Crystal violet
5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP  b) TDT  c) D  d) None of the above.
6) HEPA filters can remove particles of size ________________
   a) 0.2 um  b) 0.3 um  c) 0.4 um  d) 0.5 um
7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms  b) Anaerobic organisms  c) Facultative anaerobic organisms  d) Microphilic organisms
8) _______________ is an example for selective media.
   a) Mac conkey agar  b) EMB agar  c) Both a & b  d) None of the above.
9) TVC refers to ____________
   a) Total viable count  b) Total viral count  c) Total viable colony  c) None of the above.
10) _______________ is an example for short term preservation of microbes.
    a) Agar slant  b) Agar slant  c) Mineral oil overlay  d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.
11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theroy of disease and to the treatment or prevention of diseases. (or)
     b) Describe koch's postulates in detail.
12) a) Describe fluorescence microscope (or)
     b) Describe capsule staining.
13) a) Write the principle and application of autoclave. (or)
     b) Comment on phenol coefficient test.
14) a) Comment on pure culture techniques. (or)
     b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.
15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
     b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - AnswerALLQuestions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease

17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.

18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.

19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.

20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II -MICROBIAL DIVERSITY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group

2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram  (b) Similarity matrix   (c) Dendrogram   (d) None of the above

3. Which of the following is a motile bacterium
   (a) Esherichia coli  (b) Klebsiella   (c) Bacillus subtilis  (d) Staphylococcus aureus

4. All the following are true about Mycoplasma except
   (a) Lack cellwall   (b) Colonies have fried egg appearance   (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes

5. The photosynthetic organelles in bacteria is
   (a) Chloroplast  (b) Plastid   (c)Thylakoid   (d) Pyrenoid

6. Bacteriorhodopsin is present in
   (a) Methanogens (b) Halophiles   (c) Thermophiles   (d) Purple sulphur bacteria

7. The sexual spores formed by Agaricus is called
   (a) Ascospores   (b)Zygospores   (c) Basidiospores   (d) Sporangiospores

8. All the following are asexual spores of fungi except
   (a) Sporangiospores   (b) Zygospores   (c) Conidiospores   (d) Chlamydospores

9. The members of phaeophyta are commonly known as
   (a) Red algae   (b) Green algae   (c) Blue green algae   (d) Brown algae

10. All the following are true about protozoa except
    (a) All members have cellwall   (b) Move by flagella/pseudopodia
     (c) Unicellular   (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) What is serotaxonomy? explain. Or
(b) Describe any two important characteristics used in serotaxonomy.

12. (a) Give distinguishing characters of clostridium. Or
(b) State the important features and significance of enterobacteria.

13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
(b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples

14. (a) Explain the life cycle of Mucor Or
(b) Describe briefly the life cycle of Dictyostelium

15. (a) Give a brief account of pseudopodia. Or
(b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
(b) List out and describe the genetic characters used in taxonomy.

17. (a) What are the general characteristics of actinomycetes? Describe. Or
(b) Give a detailed account of Bergeys manual and its importance.

18. (a) Summarise the major characteristics of archaebacteria. Or
(b) Classify the photosynthetic eubacteria listing out their important features with suitable examples

19. (a) Discuss in detail the general characteristics of fungi. Or
(b) With neat diagram describe the life cycle of Agaricus.

20. (a) Describe the general characters and the importance of Chlorophyta and phaeophyta. Or
(b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III-CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds

2. Polarly flagellated bacteria is known as ----------
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occurs in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space

4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.

5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
   Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi

6. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion

8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above

9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles

10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**

11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.

12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.

13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?

14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.

15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

**SECTION–C(5X12=60Marks)
Answer ALL Questions.**

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial
    cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.

17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.

20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                                      Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photovoltaists use -------- as source of energy
   (a) Water          (b) Pigments           (c) Light           (d) H2S

2. *Thiobacillus thiooxidans* is an example of-----------
   (a) Chemoautotrophs  (b) Heterotrophs      (c) Photoautotrophs  (d) Copiotrophs

3. The organisms which tolerate high pressure are called
   (a) Halotolerant     (b) Barotolerant      (c) Psychrophilic     (d) Thermotolerant

4. Chemostat is associated with
   (a) Synchronous culture  (b) Batch culture    (c) Continuous culture (d) Diauxic growth

5. All the following are intermediates of TCA cycle except
   (a) Citric acid       (b) Fumaric acid      (c) Lactic acid       (d) Ketoglutaric acid

6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP             (b) ED                (c) HMP              (d) TCA cycle

7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound (b) Oxygen           (c) Nitrogenous compound (d) Carbon dioxide

8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*  (b) *Chlorella* sp     (c) *Klebsiella* sp  (d) *Escherichia coli*

9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water           (b) Sunlight          (c) H2S              (d) O2

10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid          (b) Carbohydrate     (c) Protein         (d) None of the above

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.

12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.

13. (a) Giving suitable example, describe substrate level phosphorylation. Or
    (b) Describe ED pathway.

14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.

15. (a) What is anoxygenic photosynthesis? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria. Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.

17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with CO2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
(b) Describe the C3 pathway of CO2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization b. moist air sterilization c. membrane filtr d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization b. incineration c. autoclave d. oven.
3. Lyophilization is the
   a. separation of proteins b. sudden freezing and dehydration
     c. enzyme reaction by oxidation d. high pressure–segmentation.
4. The pH is defined as
   a. logH⁺ b. log2H⁺ c. -logH⁺ d. -log2H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution b. lead sulphate c. anions d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid b. lipid c. protein d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solutio b. nucleic acid c. proteins d. enzymes.
8. NPK analysis is done using
   a. electrophoresi b. centrifugation c. flame photo d. chromatography.
9. The pH of the blood is
   a. 6.3 b. 7.4 c. 7.0 d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
(b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
b. Write a note on NPK analysis.
15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.
17.a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?
18.a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.
19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.
20.a. What is a buffer solution? State the common buffer compounds used in biology. with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV  b) Retrovirus  c) Pox  d) Bacteriophage
2) Which form of DNA is prevalent in living cells?
   a) A  b) B  c) C  d) Z
3) ---------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase  b) helicase  c)polymerase  d) primase
4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg  c) Meselson &stahl  d) Hershey & Chase
5) --------- no of codons constitute the coding dictionary
   a) 64  b) 61  c) 62  d) 60
6) CAP is involved in---------?
   a) Catabolic repression b) Induction c) feedback inhibition d) None of these
7) ---------is an example for intercalating agent?
   a) Acridine orange b) EMS c) Nitrous oxide d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS b) photoreactivation c) Exision repair d) all of the above
9) Davis-u-tube expt is used to prove the existence of--------?
   a) Transformation b) conjugation c) transduction d) recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith b) Sanger c) Grick d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell? OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage? OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs                                Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as _______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) __________________ are substances that, when mixed with an antigen and injected with
   it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) __________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to _______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as _____________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as __________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ___________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION – B (5X6 = 30 Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejections.

SECTION – C (5X12 = 60 Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY
Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time
   combination of
   (a) 62.8°C, 30 min (b) 62.5°C, 30 min (c) 71.7°C, 15 sec (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus (b) Bacillus (c) Saccharomyces (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather (b) springer (c) flipper (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce (b) yoghurt (c) bread (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides (b) Streptococcus faecalis
   (c) Pediococcus cerevisiae (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample (b) storage of sample at room temperature for 24 hr
   (c) gathering information (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

SECTION-B (5X6=30 Marks) - Answer ALL Questions.
11a) What is the significance of molds in food microbiology? Describe. (or)
   b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful
      effects.
12a) Discuss the drying process as a method of food preservation. (or)
    b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
    b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
    b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.
19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI (b) EcoRI (c) HindIII (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase (b) E.coli ligase (c) Sal ligase (d) All
3. Phosphorimidite method is used for the synthesis of
   (a) DNA (b) Protein (c) Phosphatase (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosomal (b) Double stranded (c) Self replicating (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi.
7. Colony hybridization technique is employed for
   (a) Selection of vector (b) Unhybridised ones (c) Selection of desirable clones (d) None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation (b) Microinjection (c) Transformation (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus (b) Thermus aquaticus (c) Thermobacter aquaticus (d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot (b) Northern blot (c) Western blot (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. (a) Define cloning. Explain the various steps involved in cloning. Or 
   (b) Explain the action of Methylases.

12. (a) Write a note on YAC. Or 
   (b) Explain a typical cosmid vector.

13. (a) Give an account on cDNA synthesis. Or 
   (b) How will you purify plasmid DNA?

14. (a) How alpha complementation of lac Z helps one to identify clone? Or 
   (b) How will you identify a recombinant DNA by immunological assay?

15. (a) Explain Northern blotting technique. Or 
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16. (a) Define restriction enzyme and add a note on classification and its uses. Or 
   (b) Give a brief account on ligases.

17. (a) Explain the construction of cDNA and DNA library. Or 
   (b) Explain the chemical synthesis of DNA in laboratory.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or 
   (b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Give a detailed account on gene transfer techniques. Or 
   (b) How will you identify the presence of r DNA in a cell?.

20. (a) Explain Southern blotting technique and its applications. Or 
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II 
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs 
aximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1)  -------------- are broad spectrum antiviral products
   a) Histones    b)IFN    c) Streptomycin    d)Nystatin

2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c)Xanthococcus  d) Zymomonas

3)  -------------- is involved in the fusion of myloma cells with spleen cells
   a) PEG    b)PGA    c) IPTG    d) EtBr

4) Vaccines that require a carrier molecule for its activity is called as  --------------
   a) Subunit    b) Whole cell    c) Antiidiotype    d) Peptide

5)  -------------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes    b) Right border    c) Left border    d) IAA

6) Nopaline is  --------------
   a) Unusual Amino acid    b) Nucleotide    c) Vitamin    d) Coenzyme

7) Example of an animal model involved in transgenesis
   a) Monkey    b) Snake    c)Dinosaurs    d) Mice
8) ------------ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) ------------ marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION – B(5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons  (or)
    d) List the us Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application ad development of transgenic sheep  (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors  (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP  (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins  (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies  (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides  (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19) a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application  (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application  (or)
    b) Give a deailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1.  Erlenmeyer flasks are used in fermentation process during
    a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2.  Glutamic acid is used for
    a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3.  Steady state is achieved in ______________ fermentation.
    a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a________________
   a. open culture system    b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system
5. Streptomycin fermentation by S. griseus produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag   b. log   c. stationary   d. decline
7. The term single –cell protein was coined at--------- in 1966
   a. CFTRI, Mysore   b. Massachusetts Institute of technology
   c. MTCC   d. Imperial chemical Industries.
8. ___________ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control   c. sterilization   d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid   c. both   d. none

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. Discuss the significance of microbes in the production of commercially important products.
     (or) b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture   (or)
     .b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.   (or)
     b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making   (or)
     .b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.   (or)
     b. Write short notes on batch filters that are employed in down streaming processing.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Give a detailed account on the various methods of strain improvement   (or)
     b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.   (or)
     b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.   (or)
     b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.   (or)
     b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.   (or)
     b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs  
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) ----------- is an example of recalcitrant compound a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an an example for ----------- degradation a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) ----------- is a cellulolytic bacteria a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium  exist as ----------- in the nodules a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability ----------- number of E.coli can present in 100 ml of water a) 1  b)0  c)10  d) 100

9) Application of alum is in ----------- phase of water treatment

10) Super Bug was developed and patented by ----------- a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or) b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or) b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or) b) Explain carbon cycle

14a) Discuss MPN technique (or) b) Explain Eutrophication

15a) Describe Air pollution (or) b) Explain the methodology involved in Microbiological Air quality

SECTION – C(5X12=60Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or) b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or) b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or) b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or) b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or) b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?
   (a) Bejerinck    (b) D. Ivanowski   (c) W. Stanley    (d) M. Theiler
2. The spikes are otherwise
   (a) Peplomers       (b) Capsid    (c) Envelope    (d) Coat
3. The one step growth experiment was developed by
   (a) Bejerinck     (b) D. Ivanowski  (c) W. Stanley  (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is
   (a) T4 phage       (b) MS2       (c) QB    (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called
   (a) Conduction     (b) Transfection (c) Insertion   (d) Induction
6. The int gene codes for the synthesis of an enzyme
   (a) Integrase      (b) Ligase    (c) Excisionase  (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called
   (a) Non – infectious ss RNA (b) Infectious ss RNA (c) Non – infectious ss DNA (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through
   (a) Endodesmata    (b) Pore    (c) Echodesmata    (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on
   (a) Plasma membrane (b) cytoplasm (c) Nucleus (d) None of the above
10. For measles, the immunogen is
    (a) Active but attenuated (b) Inactive but attenuated (c) Inactive heat killed (d) Inactivated

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or
    (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or
    (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or
    (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or
    (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or
    (b) Give a brief outline on Rubella virus.

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or
    (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or
    (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or
    (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or
    (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or
    (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease
   a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called
   a. immuned       b. carrier c. vector d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococci       b. staphylococci     c. Pseudomonas d. Vibrio
4. Toxigenicity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus b. Corynebacterium c. Clostridium d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease       b. lock jaw c. hepatitis d. rabies
7. Food borne intoxication is caused by
   a. Salmonella b. E.coli c. Shigell d. Staphylococcus
8. Darting motility is seen with
   a. E.coli b. Streptococcus c. V.cholerae d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar b. BSA c. LJ d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces b. urine c. sputum d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.
11.a. Define and differentiate carriers. (or)
     b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)
     b. Give the features of B.anthracs
13.a. Describe the methods for diagnosis to tetanus (or)
     b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)
     b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidiae. (or)
     b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16.a. Elucidate the methods of transmission of infection with examples. (or)
     b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
     b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs
Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha          b) Mycelium          c) Mould          d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci  b) P. notatum  c) Rhizopus  d) Mucor

3. Candidosis is caused mainly by ________________
   a) C. albicans  b) C. tropicalis  c) C. pseudotropicalis  d) C. krusei

4. The major organism which causes urinary tract infection is ________________
   a) E. coli  b) Salmonella  c) Shigella  d) Klebsiella

5. Traveller's diarrhea is caused by ________________
   a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli  c) Enteroinvasive E. coli  d) Enterotoxigenic E. coli

6. Blue pus is caused by ______ a) Pseudomonas  b) Vibrio  c) Salmonella  d) E. coli

7. Sexually transmitted disease is caused by ________________
   a) Treponema  b) Klebsiella  c) Proteus  d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as ________________
   a) Septicemia  b) bacteremia  c) Viremia  d) Algemia

9. MIC denotes ________________
   a) Maximum inhibitory concentration  b) Minimum inhibitory concentration  c) Multiple inhibitory concentration  d) None of the above

10. Endoflagella is a characteristic nature present in ________________
    a) Spriochetes  b) Salmonella  c) Proteus  d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium   (or) b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or) b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17. a) Describe Trichusis trichura  (or)
    b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli  (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis  (or) b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER  I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuart's medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION B (5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
   b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections? (OR)
   b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method? (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
   b) Describe the procedures used for culturing anaerobic microorganisms.
17. a) Classify infectious biological agents on the basis of hazards. (OR)
   b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.
18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
   b) How can individual pathogenic viruses be identified in the lab.
19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
   b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.
20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
   b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample
2. All the following are acid fast except,
   a) *Mycobacterium*  b) *Actinomycetes*  c) *Nocardia*  d) *Staphylococci*
3. The common medium used for growing *M tuberculosis* is 
   a) Blood agar  b) Mac conkey agar  c) Lowenstein Jensen’s medium  d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) E. coli  b) *Kiebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*
5. Selective medium for *Staphylococci* is a) EMB agar  b) BSA  c) MSA  d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm
7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies  d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None
10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.
11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.
12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.
13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.
14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.
15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.
17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.
18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity.(OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.
19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.
20. a) What information is essential for the design of a pathogen specific nucleotide probe? Where can one obtain such information? In this information available for all pathogens.(OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY
Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria b) Protozoa c) Virus d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus b) Candida c) Saccharomyces d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon b) Trophozoites and cyst are found in duodenum c) CFT is diagnostic d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium b) Taenia saginata c) Taenia corporis d) Taenia pedis
5. Of the following organisms, which has a bigger size?
6. Hookworm infection is by
   a) Ingestion of embryonated eggs b) Larvae penetrating through the skin
   b) c) Ingestion of larvae d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar b) Cell culture c) Corn meal agar d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA b) IHA c) Immunoelectrophoresis d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg b) HBsAg + HBcAg c) HBsAg + Core antibody d) HBcAg
10. Viruses are
    a) Found primarily in soil b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing
    another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dengatophytozes. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniase in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — Piasmodium. (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**

Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology / Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**

The course of study for the UG degree courses of all branches shall consist of the following

- **a) Part - I**
  Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

  The subject shall be offered during the first four semesters with one examination at the end of each semester.

- **b) Part – II : English**
  The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

- **c) Foundation Course**
  The Foundation course shall comprise of two stages as follows:
  - Foundation Course A : General Awareness (I & II semesters)
  - Foundation Course B : Environmental Studies (III & IV semesters)

  The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.

  | From the printed material supplied by the University | 75% |
  | Current affairs & who is who?                     | 25% |
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A**: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester.

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme**:
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows:

- A-Exemplary
- B-very good
- C-good
- D-fair
- E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

a) A candidate will be permitted to appear for the university examinations for any semester if

i) He/she secures not less than 75% of attendance in the number of working days during the semester.

ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and

iii) His/her conduct has been satisfactory.

Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

(ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

(iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**

No candidate shall be eligible for conferment of the Degree unless he / she,

i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.

ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.

iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**

A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.

The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**

Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for part III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-.

14. **Evening College**

The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**

The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**

The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**

Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
## SCHEME OF EXAMINATIONS

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* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

• Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_),Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour,Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II
Taxanomy of Eubacteria and Actinomycetes – Detailed classification upto genus level with general characters of each group – Bergey’s Manual and its importance.

UNIT – III
Taxanomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxanomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora ,Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacdpilipes.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganism-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LGB- Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – McIntosh fields jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT - III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT –III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al./Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA-replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER – V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT - III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT - IV


UNIT - V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References

SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application.-Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - II

UNIT –I
Microbial synthesis of commercial products - Proteins - Pharmaceuticals – Interferons - Human growth hormone- Antibiotics - Biopolymers.

UNIT –II
Vaccines – subunit vaccines – Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III
Transgenic plants - Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV

UNIT - V
DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References

SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References

SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT-II


UNIT-III


UNIT-IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagonosis of Hepatitis (A.B). Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References


SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of
epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis,
Corynebacterium diptheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive
Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative
organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella,
Pseudomonas, Vibrio cholerae.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium
Tuberculosiis, Mycobacterium leprae, Treponema pallidum, Leptospira,
Chlamydas, Rickettsiae.

References
1. Mackie and Mc catney, 1994, Medical Microbiology No I and II. Churchill
   Livingston, 14th edition.
   Longman.
   Calcutta.
   Mosby Publications.
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange
   Medical Publications, USA
SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II

MEDICAL MICROBIOLOGY - II

UNIT - I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancrofti, Enterobias, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT - V

References
SEMESTER VI
GRA CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of E. coli plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus and Streptococcus pyogenes.
6. Identification of clinically important fungi – Candida albicans, Cryptococcus neoformans and Aspergillus
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – Aspergillus, Mucor, Penicillium, Rhizopus
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – Entamoeba, Plasmodium, Ascaris, Taenia.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT – I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology – Collection and transport of clinical specimens – Direct
Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal
susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal
and urino-genital specimen.

UNIT –III
Identification of Intestinal Protozoa – Amoeba, Blood protozoa – Malaria, Intestinal Helminthes
and Blood Helminthes.

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and
solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of
viruses.

References
   Hyderabad.
   Ltd. Kolkata.
5. Textbook of Medical Parasitology, Subash O. Barija , 1996. First edition. All India
   Publishers and Distributors Regd. 920 Poonamallee High Road, Chennai.
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert koch  b) Louis Pasteur  c) Antony Von Leewenhock  d) Both b & c

2) Immunity mediated by antibodies are called as _________________
   a) Humoral  b) Cell mediated  c) Active  c) Passive

3) ____ is the ability of a lens to separate or distinguish between small objects that are close together.

4) ___________ is used as a counter stain in sparse staining
   a) Safranin  b) Methylene blue  c) Malachite green  d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP  b) TDT  c) D  d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um  b) 0.3 um  c) 0.4 um  d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms  b) Anaerobic organisms  c) Facultative anaerobic organisms  d) Microphilic organisms

8) _______________ is an example for selective media.
   a) Mac conkey agar  b) EMB agar  c) Both  a & b  d) None of the above.

9) TVC refers to ____________
   a) Total viable count  b) Total viral count  c) Total viable colony  c) None of the above.

10) ______________ is an example for short term preservation of microbes.
    a) Agar slant  b) Agar slant  c) Mineral oil overlay  d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theroy of disease and to the treatment or prevention of diseases. (or)
    b) Describe Koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION – C (5X12 = 60 Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain  (b) Genus  (c) Species  (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram  (b) Similarity matrix  (c) Dendrogram  (d) None of the above
3. Which of the following is a motile bacterium
   (a) Esherichia coli  (b) Klebsiella  (c) Bacillus subtilis  (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall  (b) Colonies have fried egg appearance  (c) Require sterols for growth  (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast  (b) Plastid  (c) Thylakoid  (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens  (b) Halophiles  (c) Thermophiles  (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores  (b) Zygosporae  (c) Basidiospores  (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores  (b) Zygosporae  (c) Conidiospores  (d) Chlamydosporae
9. The members of phaeophyta are commonly known as
   (a) Red algae  (b) Green algae  (c) Blue green algae  (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall  (b) Move by flagella/pseudopodia
    (c) Unicellular  (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or  
   (b) Describe any two important characteristics used in serotaxonomy.  
12. (a) Give distinguishing characters of clostridium. Or  
   (b) State the important features and significance of enterobacteria.  
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or  
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples  
14. (a) Explain the life cycle of Mucor Or  
   (b) Describe briefly the life cycle of Dictyostelium  
15. (a) Give a brief account of pseudopodia. Or  
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or  
   (b) List out and describe the genetic characters used in taxonomy.  
17. (a) What are the general characteristics of actinomycetes? Describe. Or  
   (b) Give a detailed account of Bergey’s manual and its importance.  
18. (a) Summarise the major characteristics of archaebacteria. Or  
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples  
19. (a) Discuss in detail the general characteristics of fungi. Or  
   (b) With neat diagram describe the life cycle of Agaricus.  
20. (a) Describe the general characters and the importance of Chlorophyta and Phaeophyta. Or  
   (b) Explain the general characters of sporozoans with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks)  
Choose the correct answer for each from the FOUR alternatives given
1. The chemical nature of Gram negative bacteria  
   (a) Peptidoglycan (b) Lipopolysaccharide  
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds  
2. Polarly flagellated bacteria is known as ---------  
   (a) Lophotrichous (b) Peritrichous  
   (c) Atrichous (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria  
   (c) Polyphosphate granules  (d) Periplasmic space  
4. Features of nuclear envelope includes  
   (a) Ribosomes (b) A double membrane structure  
   (c) Communication with cytoplasm  (d) Both b & c.  
5. Insertional vectors are derived from  
   (a) Bacterial plasmid (b) Phage lambda  
   (c) M13 Phage (d) Yeast plasmid  
6. Cosmid are novel vector that combines the features of  
   (a) Phage  (b) Plasmid  (c) Plasmid and phage (d) Fungi  
7. Linked transport of two substances in the same direction is called  
   (a) Antiport (b) Facilitated diffusion  (c) Symport  (d) Passive diffusion  
8. Facilitated diffusion mechanism are found most commonly in  
   (a) Eukaryotic cells (b) Prokaryotic cells  
   (c) Both a & b (d) None of the above  
9. The bacteria that thrive at sodium chloride concentration above 15% are known as  
   (a) Halophiles (b) Extreme thermophiles  
   (c) Acidophiles (d) Osmophiles  
10. In Archaeabacteria the lipids are linked by  
   (a) Monomer linkage (b) Ether linkage  
   (c) B1-4 linkage (d) Ionic linkage  

SECTION–B(5X6=30Marks) - Answer ALL Questions.  
11. (a) Describe the capsule and slime layer of prokaryotic cell.  
    (b) Write a note on reserve materials.  
12. (a) Explain the structure and functions of Endoplasmic reticulum.  
    (b) Write short notes on Nucleus.  
13. (a) Give an account on cDNA synthesis.  
    (b) How will you purify plasmid DNA?  
14. (a) Explain Facilitated diffusion.  
    (b) Write a note on phagocytosis and pinocytosis.  
15. (a) Write a note on cell wall of Archaeabacteria.  
    (b) What are methanogens? Exemplify the role with examples.  

SECTION–C(5X12=60Marks)  
Answer ALL Questions.  

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization.  
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.  
17. (a) Explain the structure and functions of Mitochondria and Chloroplast.  
    (b) Write a brief account on eukaryotic cell wall.  
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  
    (b) Give a brief account on lambda phage derived cloning vectors.  
19. (a) Write a brief note on active transport of nutrients in a bacterial cell.  
    (b) Give a brief account on group translocation mechanism.  
20. (a) Give a brief account on Halophiles.  
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                                                                 Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water         (b) Pigments       (c) Light       (d)H2S

2. *Thiobacillus thiooxidans* is an example of---------
   (a) Chemoautotrophs   (b) Heterotrophs   (c) Photoautotrophs   (d) Copiotrophs

3. The organisms which tolerate high pressure are called
   (a) Halotolerant     (b) Barotolerant   (c) Psychrophilic   (d) Thermotolerant

4. Chemostat is associated with
   (a) Synchronous culture   (b) Batch culture   (c) Continuous culture   (d) Diauxic growth

5. All the following are intermediates of TCA cycle except
   (a) Citric acid      (b) Fumaric acid   (c) Lactic acid   (d) Ketoglutaric acid

6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP         (b) ED           (c) HMP       (d) TCA cycle

7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound   (b) Oxygen    (c) Nitrogenous compound   (d) Carbon dioxide

8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*    (b) *Chlorella* sp    (c) *Klebsiella* sp    (d) *Escherichia coli*

9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water        (b) Sunlight       (c) H2S        (d) O2

10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid        (b) Carbohydrate  (c) Protein        (d) None of the above

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.

12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.

13. (a) Giving suitable example, describe substrate level phosphorylation. Or
    (b) Describe ED pathway.

14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.

15. (a) What is anoxygenic photosynthesis? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria. Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.

17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
(b) Describe the C3 pathway of CO2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization  b. incineration  c. autoclave  d. oven.
3. Lyophilization is the
   a. separation of proteins  b. sudden freezing and dehydration  c. enzyme reaction by oxidation  d. high pressure–segmentation.
4. The pH is defined as
   a. logH⁺  b. log2H⁺  c. -logH⁺  d. -log2H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solution  b. nucleic acid  c. proteins  d. enzymes.
8. NPK analysis is done using
   a. electrophoresi  b. centrifugation  c. flame photometry  d. chromatography.
9. The pH of the blood is
   a. 6.3  b. 7.4  c. 7.0  d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION B (5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
   b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry.  (or)
  b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
  b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge.  (or)
  b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications.  (or)
  b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
  b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter?  (or)
  b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology. with their applications  (or)
  b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs                           Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV       b) Retrovirus   c) Pox       d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A       b) B       c) C       d) Z

3) -------- Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase   b) helicase  c)polymerase   d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg c) Meselson &stahl  d) Hershey & Chase

5) ---------- no of codons constitute the coding dictionary
   a) 64       b) 61       c) 62       d) 60
6) CAP is involved in----------?
   a) Catabolic repression  b) Induction c) feed back inhibition  d) None of these
7) ----------is an example for intercalating agent?
   a) Acridine orange  b) EMS  c) Nitrous oxide  d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair  d) all of the above
9) Davis-u-tube expt is used to prove the existance of--------?
   a) Transformation  b) conjugation  c) transduction  d) recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA  OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment  OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code  OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test  OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction  OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?  OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli  OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?  OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene  OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock   b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis   b) Hematopoiesis   c) Hemoglobin   d) None of the above.

3) __________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody   b) Haptens   c) Adjuvants   d) Epitopes

4) ____________________ is the immunoglobulin which can cross the placenta.
   a) IgA   b) IgD   c) IgM   d) IgG

5) Type I hypersensitivity is otherwise called as ____________
   a) Cell Stimulating   b) Delayed type   c) Anaphylactic   d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator   b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator   d) None of the above.

7) The antibody causing agglutination is called as ____________
   a) Precipitin   b) Agglutinin   c) Agglutinogen   d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ____
   a) Ligand   b) Analyte   c) Both a & b   d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ______
   a) Allografts   b) Autograft   c) Isograft   d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ____________
    a) Adoptive immunisation   b) Adaptive immunisation   c) Combined   d) None of the above.

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
(a) lacti (b) pyruvic acid (c) fumaric acid (d) amino acids
2. All the following genera of bacteria produce pigments except
(a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
(a) 62.8°C, 30 min (b) 62.5°C, 30 min (c) 71.7°C, 15 sec (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
(a) Aspergillus (b) Bacillus (c) Saccharomyces (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
(a) beer (b) sauerkraut (c) soft drinks (d) fruit juice
6. A can with a minute leak during storage is called a
(a) breather (b) springer (c) flipper (d) sparger
7. The term leavening is associated with the preparation of
(a) soy sauce (b) yoghurt (c) bread (d) cheese
8. All the following organisms contribute to acidity in idli batter except
(a) Leuconostoc mesenteroides (b) Streptococcus faecalis (c) Pediococcus cerevisiae (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
(a) collection of sample (b) storage of sample at room temperature for 24 hr (c) gathering information (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
(a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

SECTION - B (5X6=30Marks) - Answer ALL Questions.

11a) What is the significance of molds in food microbiology? Describe. (or)
b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
15b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
16b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
17b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
18b) Discuss the biological spoilage of canned foods.
19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
19b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
20b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHII  (b) EcoRI  (c) HindIII  (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase  (b) E.coli ligase  (c) Sal ligase  (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA  (b) Protein  (c) Phosphatase  (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosomal  (b) Double stranded  (c) Self replicating  (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  (c)M13 Phage  (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi.
7. Colony hybridization technique is employed for
   (a)Selection of vector  (b)Unhybridised ones  (c)Selection of desirable clones  (d)None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation  (b) Microinjection  (c) Transformation  (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus  (b) Thermus aquaticus  (c) Thermobacter aquaticus(d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot  (b) Northern blot  (c) Western blot  (d) Eastern blot
SECTION-B (5X5=25Marks) - Answer ALL Questions.

11. (a) Define cloning. Explain the various steps involved in cloning. Or
   (b) Explain the action of Methylases.

12. (a) Write a note on YAC. Or
   (b) Explain a typical cosmid vector.

13. (a) Give an account on cDNA synthesis. Or
   (b) How will you purify plasmid DNA?

14. (a) How alpha complementation of lac Z helps one to identify clone? Or
   (b) How will you identify a recombinant DNA by immunological assay?

15. (a) Explain Northern blotting technique. Or
   (b) Give an account on RAPD.

SECTION-C (5X8=40Marks) - Answer ALL Questions.

16. (a) Define restriction enzyme and add a note on classification and its uses. Or
   (b) Give a brief account on ligases.

17. (a) Explain the construction of cDNA and DNA library. Or
   (b) Explain the chemical synthesis of DNA in laboratory.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
   (b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Give a detailed account on gene transfer techniques. Or
   (b) How will you identify the presence of r DNA in a cell?

20. (a) Explain Southern blotting technique and its applications. Or
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs

Choose the correct answer for each from the FOUR alternatives given

1) ----------- are broad spectrum antiviral products
   a) Histones  b) IFN  c) Streptomycin  d) Nystatin

2) Xanthan gum is produced from
   a) Pseudomonas putida   b) Xanthomonas campestris c) Xanthococcus d) Zymomonas

3) ----------- is involved in the fusion of myloma cells with spleen cells
   a) PEG  b) PGA  c) IPTG  d) EtBr

4) Vaccines that require a carrier molecule for its activity is called as -----------
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide

5) ----------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA

6) Nopaline is -----------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme

7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c) Dinosaurs  d) Mice
8) __________ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) __________ marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION – B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
    d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application and development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19) a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in ______________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a________________
   a. open culture system  b. system that maintains constant cell conc.
   c. system with addition of nutrients  d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product  b. Vitamin B12 as a by product
   c. Vitamin C as a by product  d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag  b. log  c. stationary  d. decline
7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore  b. Massachusetts Institute of technology
   c. MTCC  d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol  b. methane  c. oil  d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery  b. quality control  c. sterilization  d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid  b. amino acid  c. both  d. none

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. Discuss the significance of microbes in the production of commercially important products.
    (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture  (or)
    .b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.  (or)
    .b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making  (or)
    .b. Write about single cell protein.
15.a. Discuss the methods disruption of cells by physical methods.  (or)
    .b. Write short notes on batch filters that are employed in down streaming processing.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Give a detailed account on the various methods of strain improvement  (or)
    .b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.  (or)
    .b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.  (or)
    .b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.  (or)
    .b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.  (or)
    .b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is  
a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism
2) Mycorhizal association is an example of  
a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis
3) ____________ is an example of recalcitrant compound  
a) Lignin  b) Protein  c) Carbohydrate  d) Lipid
4) Fermentation is an an example for ____________ degradation  
a) Aerobic  b) Anaerobic  c) a and b  d) None of the above
5) ____________ is a cellulytic bacteria  
a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas
6) Rhizobium exist as ____________ in the nodules  
a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above
7) Azospirillum is an example for  
a) Free living  b) Symbiotic  c) associative  d) all the above
8) According to the American standard of potability ____________ number of E.coli can present in 100 ml of water  
a) 1  b) 0  c) 10  d) 100
9) Application of alum is in ____________ phase of water treatment
10) Super Bug was developed and patented by ____________  
a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism  
    b) List the factors influencing density of microbes in soil
12a) Discuss the biology of composting  
    b) Comment on microbial decomposition of lignin
13a) Write short notes on biofertilizers  
    b) Explain carbon cycle
14a) Discuss MPN technique  
    b) Explain Eutrophication
15a) Describe Air pollution  
    b) Explain the methodology involved in Microbiological Air quality

SECTION – C(5X12=60)Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association  
    b) Comment on microbial communities in the soil
17a) Explain aerobic and anaerobic degradation  
    b) Write an essay on dynamics of soil microbes
18a) Detail on symbiotic nitrogen fixation which involves root nodules  
    b) Explain phosphorus and sulphur cycle
19a) Write a detailed essay on water treatment  
    b) Explain the microbial composition and dynamics of aquatic ecology
20a) Write an essay on air sampling devices  
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV? (a) Bejerinck    (b) D. Ivanowski  (c) W. Stanley    (d) M. Theiler
2. The spikes are otherwise: (a) Peplomers     (b) Capsid  (c) Envelope    (d) Coat
3. The one step growth experiment was developed by (a) Bejerinck     (b) D. Ivanowski   (c) W. Stanley     (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is: (a) T4 phage    (b) MS2  (c) QB     (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called (a) Conduction     (b) Transfection   (c) Insertion    (d) Induction
6. The int gene codes for the synthesis of an---------enzyme (a) Integrase     (b) Ligase   (c) Excisionase    (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA    (b) Infectious ss RNA
(b) Non – infectious ss DNA    (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through (a) Endodesmata    (b) Pore  (c) Echodesmata     (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane    (b) cytoplasm  (c) Nucleus     (d) None of the above
10. For measles, the immunogen is (a) Active but attenuated    (b) Inactive but attenuated    (c) Inactive heat killed    (d) Inactivated

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or (b) Give a brief outline on Rubella virus.

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I
Duration – 3hrs  Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. An example of zoonotic disease a. Malaria b. filariasis c. plaque d. all the above
2. Persons with symptomless infection is called a. immuned b. carrier c. vector d. resistant
3. The commonest cause of localized suppurative lesion in man is a. streptococci b. staphylococci c. Pseudomonas d. Vibrio
5. Spot the Gram positive anaerobic endospore forming bacillus a. Lactobacillus b. Corynebacterium c. Clostridium d. Mycobacterium
6. Clostridium tetani is the causative agent of a. anthrax disease b. lock jaw c. hepatitis d. rabies
7. Food borne intoxication is caused by a. Salmonella b. E.coli c. Shigell d. Staphylococcus
8. Darting motility is seen with a. E.coli b. Streptococcus c. V.cholerae d. S.typhi
9. Which one of the following media is used for the cuItivation of M.leprae a. SS agar b. BSA c. LJ d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is a. faeces b. urine c. sputum d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.
11.a. Define and differentiate carriers. (or)
     b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)
     b. Give the features of B.anthracis
13.a. Describe the methods for diagnosis to tetanus (or)
     b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)
     b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidia. (or)
     b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16.a. Elucidate the methods of transmission of infection with examples. (or)
     b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
     b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ______________
   a) Hypha              b) Mycelium       c) Mould             d) Fungi
2. ______________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci      b) P. notatum      c) Rhizopus          d) Mucor
3. Candidosis is caused mainly by ______________
   a) C. albicans       b) C. tropicalis   c) C. pseudotropicalis d) C. krusei
4. The major organism which causes urinary tract infection is ______________
   a) E. coli           b) Salmonella     c) Shigella           d) Klebsiella
5. Traveller's diarrhea is caused by ______________
   a) Enteropathogenic E. coli   b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli     d) Enterotoxigenic E. coli
6. Blue pus is caused by ______ a) Pseudomonas b) Vibrio     c) Salmonella d) E. Coli
7. Sexually transmitted disease is caused by ______________
   a) Treponema          b) Klebsiella     c) Proteus            d) Pseudomonas
8. Invasion of microorganisms into the bloodstream is called as___________
   a) Septicemia         b) bacteremia     c) Viremia            d) Algemia
9. MIC denotes ______________
   a) Maximum inhibitory concentration b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration d) None of the above
10. Endoflagella is a characteristic nature present in ______________
    a) Spriochetes        b) Salmonella     c) Proteus           d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium    (or)    b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or)    b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17. a) Describe Trichusis trichura (or)
    b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis (or)    b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients’ blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuart’s medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION B (5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
b) Describe the procedures used for culturing anaerobic microorganisms.
17. a) Classify infectious biological agents on the basis of hazards.  (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.
18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
b) How can individual pathogenic viruses be identified in the lab.
19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture?  (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.
20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs  
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine.  b) Mid stream urine  c) Urine from catheter bag  d) Early morning urine sample
2. All the following are acid fast except,
   a) *Mycobacterium*  b) *Actinomycetes*  c) *Nocardia*  d) *Staphylococci*
3. The common medium used for growing *M tuberculosis* is
   a) Blood agar  b) Mac conkey agar  c) Lowenstein Jensen’s medium  d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC+++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Kiebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*
5. Selective medium for *Staphylococci* is
   a) EMB agar  b) BSA  c) MSA  d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm
7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies  d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None
10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe? Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Growth medium for fungus inhibits growth of
   a) Bacteria b) Protozoa c) Virus d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus b) Candida c) Saccharomyces d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium b) Taenia saginata c) Taenia corporis d) Taenia pedis
5. Of the following organisms, which has a bigger size?
6. Hookworm infection is by
   a) Ingestion of embryonated eggs b) Larvae penetrating through the skin
   b) c) Ingestion of larvae d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar b) Cell culture c) Corn meal agar d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA b) IHA c) Immunoelectrophoresis d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg b) HBsAg + HBcAg c) HBsAg + Core antibody d) HBcAg
10. Viruses are
     a) Found primarily in soil b) Obligate intracellular parasites
     c) Can be cultivated in nutrient agar d) Can be seen in bright field microscope.

SECTION-B (5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dermatophytoses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium*. (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis? (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and
COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY
with Semester System
(with effect from 2007-2008)

1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.
      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)
      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) **Part – III**

**Group A**: Core subject – As prescribed in the scheme of examination. Examination will be conducted in the core subjects at the end of every semester.

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

   a) A candidate will be permitted to appear for the university examinations for any semester if

   i) He/she secures not less than 75% of attendance in the number of working days during the semester.

   ii) He/she earns a progress certificate from the head of the institution, of having satisfactorily completed the course of study prescribed in the subjects as required by these regulations, and

   iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical ) in the University examination shall be declared to have passed the examination in the subject (theory or Practical ).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

   a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**.

   b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

   (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

   (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   
i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
   
ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   
iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10 % of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   
The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise /amend/ change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
## SCHEME OF EXAMINATIONS

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<th>Sem</th>
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* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram”s, Spore, AFB_),Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique-- Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour,Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) - General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount – LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER – IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High speed, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT - III


UNIT – IV


UNIT – V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA– replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping , genetic recombination.

References
2. Freifelder , S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions -agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT - III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT - IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References

SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application, - Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I
Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone - Antibiotics - Biopolymers.

UNIT –II
Vaccines – subunit vaccines – Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III
Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV

UNIT -V
DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References
SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose, Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V


References


SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis,
Corynebacterium diptheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella,
Pseudomonas, Vibrio cholerae.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium
Tuberculosi, Mycobacterium leprae, Treponema pallidum, Leptospira,
Chlamydia, Rickettsiae.

References

1. Mackie and Mc catney, 1994, Medical Microbiology No I and II. Churchill Livingston,
   14th edition.
   Longman.
   Mosby Publications.
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange
   Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT - I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References
SEMESTER VI
GRA CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia.*
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT –IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectorophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References

SEMESTER V

DIPLOMA PAPER III
(DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs                                                                 Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert Koch   b) Louis Pasteur   c) Antony Von Leewenhock   d) Both b & c

2) Immunity mediated by antibodies are called as ______________
   a) Humoral   b) Cell mediated   c) Active   c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) __________ is used as a counter stain in spare staining
   a) Safranin   b) Methylene blue   c) Malachite green   d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP   b) TDT   c) D   d) None of the above.

6) HEPA filters can remove particles of size _____________
   a) 0.2 um   b) 0.3 um   c) 0.4 um   d) 0.5 um

7) McIntosh filled jar method is used for cultivating ______________
   a) Aerobic organisms   b) Anaerobic organisms
   c) Facultative anaerobic organisms   d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar   b) EMB agar   c) Both a & b   d) None of the above.

9) TVC refers to ____________
   a) Total viable count   b) Total viral count   c) Total viable colony   c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant   b) Agar slant   c) Mineral oil overlay   d) a,b & c.

SECTION B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and Koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe Koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION – C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)  
b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)  
b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)  
b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)  
b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)  
b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY

Duration – 3hrs   Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain   (b) Genus   (c) Species   (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram   (b) Similarity matrix   (c) Dendrogram   (d) None of the above
3. Which of the following is a motile bacterium
   (a) Escherichia coli   (b) Klebsiella   (c) Bacillus subtilis   (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall   (b) Colonies have fried egg appearance   (c) Require sterols for growth   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast   (b) Plastid   (c) Thylakoid   (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens   (b) Halophiles   (c) Thermophiles   (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores   (b) Zygospores   (c) Basidiospores   (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores   (b) Zygospores   (c) Conidiospores   (d) Chlamydomspores
9. The members of phaeophyta are commonly known as
   (a) Red algae   (b) Green algae   (c) Blue green algae   (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall   (b) Move by flagella/pseudopodia
    (c) Unicellular   (d) Some are pathogens
SECTION B (5X6=30 Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or
(b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
(b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
(b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.
14. (a) Explain the life cycle of Mucor Or
(b) Describe briefly the life cycle of Dictyostelium.
15. (a) Give a brief account of pseudopodia. Or
(b) Explain the general characters and the importance of Euglenophyta.

SECTION C (5X12=60 Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach. Or
(b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
(b) Give a detailed account of bergeys manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
(b) Classify the photosynthetic eubacteria listing out their important features with suitable examples.
19. (a) Discuss in detail the general characteristics of fungi. Or
(b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Chlorophyta and phaeophyta. Or
(b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds
2. Polarely flagellated bacteria is known as --------------
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occur in eukaryotes?  
   (a) Cytoplasmic membrane  (b) Mitochondria  
   (c) Polyphosphate granules  (d) Periplasmic space

4. Features of nuclear envelope include  
   (a) Ribosomes  (b) A double membrane structure  
   (c) Communication with cytoplasm  (d) Both b & c.

5. Insertional vectors are derived from  
   (a) Bacterial plasmid  (b) Phage lambda  (c) M13 Phage  (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of  
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi

7. Linked transport of two substances in the same direction is called  
   (a) Antiport  (b) Facilitated diffusion  (c) Symport  (d) Passive diffusion

8. Facilitated diffusion mechanism are found most commonly in  
   (a) Eukaryotic cells  (b) Prokaryotic cells  (c) Both a & b  (d) None of the above

9. The bacteria that thrive at sodium chloride concentration above 15% are known as  
   (a) Halophiles  (b) Extreme thermophiles  (c) Acidophiles  (d) Osmophiles

10. In Archaebacteria the lipids are linked by  
    (a) Monomer linkage  (b) Ether linkage  (c) B 1-4 linkage  (d) Ionic linkage

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Describe the capsule and slime layer of prokaryotic cell.  
    Or
    (b) Write a note on reserve materials.

12. (a) Explain the structure and functions of Endoplasmic reticulum.  
    Or
    (b) Write short notes on Nucleus.

13. (a) Give an account on cDNA synthesis.  
    Or
    (b) How will you purify plasmid DNA?

14. (a) Explain Facilitated diffusion.  
    Or
    (b) Write a note on phagocytosis and pinocytosis.

15. (a) Write a note on cell wall of Archaebacteria.  
    Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION–C(5X12=60Marks)  
Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization.  
    Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.

17. (a) Explain the structure and functions of Mitochondria and Chloroplast.  
    Or
    (b) Write a brief account on eukaryotic cell wall.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  
    Or
    (b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Write a brief note on active transport of nutrients in a bacterial cell.  
    Or
    (b) Give a brief account on group translocation mechanism.

20. (a) Give a brief account on Halophiles.  
    Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water        (b) Pigments    (c) Light      (d)H2S
2. Thiobacillus thiooxidans is an example of---------
   (a)Chemoautotrophs (b)Heterotrophs (c)Photoautotrophs (d)Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant   (b) Barotolerant (c) Psychrophilic  (d)Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture   (b)Batch culture    (c) Continous culture (d)Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid   (b) Fumaric acid  (c) Lactic acid (d) ketoglutaric acid
6. The two enzymes ,transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP   (b) ED      (c) HMP      (d)TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound   (b)Oxygen          (c) Nitrogenous compound    (d) Carbondioxide
8. Which of the following carries out mixed acid fermentation?
   (a) Saccharomyces cerevisiae (b)Chlorella sp  (c) Klebsiella sp  (d) Escherichia coli
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water        (b) Sunlight    (c)H2S        (d) O2
10. The carrier molecule in cell- wall biosynthesis is a----
    (a) Lipid       (b) Carbohydrate (c)Protein     (d) None of the above

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria.     Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth?Explain any one method of obtaining synchronous growth.  Or
    (b)Give an account on Diauxic growth.
13. (a) Giving suitable example , describe substrate level phosphorylation.     Or
    (b) Describe ED pathway.
14. (a)describe alcoholic fermentation.     Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a)What is anoxygenic photosynthesis ? Describe.     Or
    (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - AnswerALLQuestions.

16. (a) With neat diagram , describe the event of endospore formation in bacteria.     Or
    (b) With suitable examples , classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth..     Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or (b) What is oxidative phosphorylation? Describe.

19. (a) Explain briefly the propionic acid fermentation. Or (b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.

20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or (b) Describe the C3 pathway of Co2 fixation.

**CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS**

**Duration – 3hrs**  
**Maximum – 100 Marks**

**SECTION A ( 10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of  
   a. dry air sterilization  
   b. moist air sterilization  
   c. membrane filtr  
   d. chemical sterilization.

2. Moist heat sterilization is achieved by  
   a. lyophilization  
   b. incineration  
   c. autoclave  
   d. oven.

3. Lyophilization is the  
   a. separation of proteins  
   b. sudden freezing and dehydration  
   c. enzyme reaction by oxidation  
   d. high pressure–segmentation.

4. The pH is defined as  
   a. logH⁺  
   b. log₂H⁺  
   c. -logH⁺  
   d. -log₂H⁺

5. Which is used as an absorbent in TLC.  
   a. KCl solution  
   b. lead sulphate  
   c. anions  
   d. silica gel

6. SDS-PAGE is used to separate  
   a. nucleic acid  
   b. lipid  
   c. protein  
   d. carbohydrate.

7. UV light is significantly absorbed by  
   a. coloured solution  
   b. nucleic acid  
   c. proteins  
   d. enzymes.

8. NPK analysis is done using  
   a. electrophoresis  
   b. centrifugation.  
   c. flame photometer  
   d. chromatography.

9. The pH of the blood is  
   a. 6.3  
   b. 7.4  
   c. 7.0  
   d. 7.6

10. What is the normality of 5M NaOH solution?

**SECTION B (5X6=30 Marks) - Answer ALL Questions.**

11. a. With a schematic diagram, describe the working of a laminar flow chamber. (or)

   b. Explain the working of an incubator.

12. a. Explain the electrodes used in pH measurement. (or)

   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.

13. a. What is paper chromatography? (or)

   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)

b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”

   (or)

b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**

16.a. Discuss the principle, types and applications of centrifuge. (or)

b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)

b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)

b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)

b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology.

   with their applications (or)

b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

**CORE PAPER VI - MICROBIAL GENETICS**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A ( 10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV     b) Retrovirus  c) Pox     d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A     b) B     c) C     d) Z

3) -----------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase  b) helicase  c)polymerase  d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg c) Meselson &stahl  d) Hershey & Chase

5) ----------- no of codons constitute the coding dictionary
   a) 64     b) 61     c) 62     d) 60
6) CAP is involved in---------?
   a) Catabolic repression   b) Induction c) feed back inhibition       d) None of these
7) ---------is an example for intercalating agent?
   a) Acridine orange   b) EMS   c) Nitrous oxide       d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS   b) photoreactivation   c) Exision repair d) all of the above
9) Davis-u-tube exp is used to prove the existance of--------?
   a) Transformation b) conjugation  c) transduction d0 recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA        OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment        OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code        OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test        OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction        OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell? OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli  OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage? OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as _______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) ____________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ____________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ____________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to _______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as __________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as _________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as _________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY

Duration – 3hrs   Maximum – 100 Marks

SECTION A (10x1=10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti    (b) pyruvic acid    (c) fumaric acid    (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia    (b) Flavobacterium    (c) Micrococcus    (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time
   combination of
   (a) 62.8°C, 30 min    (b) 62.5°C, 30 min    (c) 71.7°C, 15 sec    (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus    (b) Bacillus    (c) Saccharomyces    (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer    (b) sauerkraut    (c) soft drinks    (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather    (b) springer    (c) flipper    (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce    (b) yoghurt    (c) bread    (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides    (b) Streptococcus faecalis    (c) Pediococcus cerevisiae    (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample    (b) storage of sample at room temperature for 24 hr
   (c) gathering information    (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin    (b) a neurotoxin    (c) a hepatotoxin    (d) a nephrotoxin.

SECTION – B (5x6=30 Marks) - Answer ALL Questions.

11a) What is the significance of molds in food microbiology? Describe. (or)
   b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful
      effects.
12a) Discuss the drying process as a method of food preservation. (or)
   b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
   b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
   b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria.  (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples  (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation.  (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables  (or)
b) Discuss the biological spoilage of canned foods.
19) a) How is pickled cucumbers prepared? Describe . Add a note on the defects.  (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI    (b) EcoRI    (c) HindIII   (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase    (b) E.coli ligase    (c) Sal ligase    (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA    (b) Protein    (c) Phosphatase    (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosal    (b) Double stranded    (c) Self replicating    (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid    (b) Phage lambda    (c)M13 Phage    (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage    (b) Plasmid    (c) Plasmid and phage    (d) Fungi.
7. Colony hybridization technique is employed for
   (a)Selection of vector    (b)Unhybridised ones    (c)Selection of desirable clones    (d)None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation    (b) Microinjection
   (c) Transformation    (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus    (b) Thermus aquaticus
   (c) Thermobacter aquaticus(d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot    (b) Northern blot    (c) Western blot    (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or (b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or (b) How will you identify the presence of r DNA in a cell?.
20. (a) Explain Southern blotting technique and its applications. Or (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) -------------- are broad spectrum antiviral products
   a) Histones    b)IFN    c) Streptomycin    d)Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida b) Xanthomonas campestris c)Xanthococcus d) Zymomonas
3) -------------- is involved in the fusion of myloma cells with spleen cells
   a) PEG    b)PGA    c) IPTG    d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as --------------
   a) Subunit    b) Whole cell    c) Antiidiotype    d) Peptide
5) -------------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes    b) Right border    c) Left border    d) IAA
6) Nopaline is --------------
   a) Unusual Amino acid b) Nucleotide c) Vitamin d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey    b) Snake    c)Dinosaurs    d) Mice
8) _______ method is involved development of transgenic animal
   a) Microinjection   b) Protoplast fusion   c) Hybridoma technology   d) b and c
9) ___________ marker are involved in DNA Fingerprinting
   a) VNTR   b) RFLP   c) RAPD   d) STR3
10) Father of HGP
    a) Francis Collins   b) Venter   c) James Watson   d) Hunkapillar

SECTION – B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
   d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
   b) List the uses and application of monoclonal antibodies
13a) Explain in short the application and development of transgenic sheep (or)
   b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
   b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
   b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
   b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
   b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
   b) Elucidate methods involved in generation of insect, virus, resistant plants
19) a) Discuss methodologies involved in the creation of transgenic mice also add
     brief note on its application (or)
   b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs       Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening   b. strain improvement   c. pilot scale   d. commercial operation
2. Glutamic acid is used for
   a. feed supplement   b. flavour enhancer   c. ethanol production   d. antibiotic fermentation
3. Steady state is achieved in ____________ fermentation.
   a. batch   b. fed-batch   c. continuous   d. all
4. Batch culture is a________________
   a. open culture system    b. system that maintains constant cell conc.
   c. system with addition of nutrients  d. closed culture system
5. Streptomycin fermentation by S. griseus produces
   a. Vitamin B2 as a by product       b. Vitamin B12 as a by product
   c. Vitamin C as a by product       d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag    b. log    c. stationary    d. decline
7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore    b. Massachusetts Institute of technology
   c. MTCC    d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery    b. quality control    c. sterilization    d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid    b. amino acid    c. both    d. none

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. Discuss the significance of microbes in the production of commercially important products.
   (or)    b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture    (or)
       b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.    (or)
       b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making    (or)
       b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.    (or)
       b. Write short notes on batch filters that are employed in down streaming processing.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Give a detailed account on the various methods of strain improvement    (or)
       b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.    (or)
       b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.    (or)
       b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.    (or)
       b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.    (or)
       b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs     Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism
2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis
3) ---------------- is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid
4) Fermentation is an example for -------- degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above
5) ---------------- is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas
6) Rhizobium exist as -------- in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above
7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above
8) According to the American standard of potability ----------- number of E.coli can present in 100 ml of water
   a) 1  b) 0  c) 10  d) 100
9) Application of alum is in -------- phase of water treatment
10) Super Bug was developed and patented by --------
    a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil
12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin
13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle
14a) Discuss MPN technique (or)
    b) Explain Eutrophication
15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil
17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes
18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle
19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology
20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV? (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) M. Theiler
2. The spikes are otherwise (a) Peplomers  (b) Capsid  (c) Envelope  (d) Coat
3. The one step growth experiment was developed by (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is  (a) T4 phage  (b) MS2  (c) QB  (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called (a) Conduction  (b) Transfection  (c) Insertion  (d) Induction
6. The int gene codes for the synthesis of an --------- enzyme (a) Integrase  (b) Ligase  (c) Excisionase  (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA  (b) Infectious ss RNA  (c) Non – infectious ss DNA  (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through (a) Endodesmata  (b) Pore  (c) Echodesmata  (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane  (b) cytoplasm  (c) Nucleus  (d) None of the above
10. For measles, the immunogen is (a) Active but attenuated  (b) Inactive but attenuated  (c) Inactive heat killed  (d) Inactivated

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region.  Or (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment.  Or (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage.  Or (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell.  Or (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS.  Or (b) Give a brief outline on Rubella virus.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods.  Or (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage.  Or (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny.  Or (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses.  Or (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus.  Or (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs  
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease  
   a. Malaria  b. filariasis  c. plaque  d. all the above

2. Persons with symptomless infection is called  
   a. immuned  b. carrier  c. vector  d. resistant

3. The commonest cause of localized suppurative lesion in man is  
   a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio

4. Toxigenecity of C.diphtheriae is determined by  

5. Spot the Gram positive anaerobic endospore forming bacillus  
   a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium

6. Clostridium tetani is the causative agent of  
   a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies

7. Food borne intoxication is caused by  
   a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus

8. Darting motility is seen with  
   a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi

9. Which one of the following media is used for the cultivation of M.leprae  
   a. SS agar  b. BSA  d. LJ  d. TCBS

10. The specimen generally used for suspected pulmonary tuberculosis is  
    a. faeces  b. urine  c. sputum  d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers.  
      (or)
    b. State Koch postulates.

12.a. Give the features of Streptococcus.  
       (or)
    b. Give the features of B.anthracs

13.a. Describe the methods for diagnosis to tetanus  
       (or)
    b. Describe the methods for diagnosis of gas gangrene.

14.a. Write a short note on enteric fever.  
       (or)
    b. Write a short note on bacillary dysentery.

15.a. Give the features of Chlamidia.  
       (or)
    b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples.  
       (or)
    b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.

17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same?  
       (or)
    b. Give an account of Staphylococcus aureus its morphology and diagnosis.

18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani.  
       (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.

19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli.  
       (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.

20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum.  
       (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs maximum – 75 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
a) Hypha b) Mycelium c) Mould d) Fungi
2. ________________ is an important opportunistic pathogen in HIV infected persons.
a) P. marneffci b) P. notatum c) Rhizopus d) Mucor
3. Candidosis is caused mainly by ______________
a) C. albicans b) C. tropicalis c) C. pseudotropicalis d) C. krusei
4. The major organism which causes urinary tract infection is ________________
a) E. coli b) Salmonella c) Shigella d) Klebsiella
5. Traveller's diarrhea is caused by ______________
a) Enteropathogenic E. coli b) Enterotoxigenic E. coli c) Enteroinvasive E. coli d) Enterotoxigenic E. coli
6. Blue pus is caused by _______ a) Pseudomonas b) Vibrio c) Salmonella d) E. Coli
7. Sexually transmitted disease is caused by ______________
a) Treponema b) Klebsiella c) Proteus d) Pseudomonas
8. Invasion of microorganisms into the bloodstream is called as ______________
a) Septicemia b) bacteremia c) Viremia d) Algemia
9. MIC denotes ________________
a) Maximum inhibitory concentration b) Minimum inhibitory concentration c) Multiple inhibitory concentration d) None of the above
10. Endoflagella is a characteristic nature present in ______________
a) Spirochetes b) Salmonella c) Proteus d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or) b) Describe candidiasis
12. a) Comment on Taenia solium (or) b) Give a brief note on Ascaris.
13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or) b) Describe respiratory tract infections.
14. a) Describe briefly on pyogenic infections. (or) b) Comment on Pseudomonas.
15. a) Explain the mechanism of drug resistance (or) b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or) b) Aspergillosis Describe.
17. a) Describe Trichus trichura (or) b) Comment on Wucheraria bancrofti
18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or) b) Comment on pyogenic infections caused by Staphylococcus.
19. a) Comment on meningitis (or) b) Describe pyrexia
20. a) Describe drug resistance nature of bacteria (or) b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recap, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
   a) Culturing on LJ medium
   b) Acid fast staining
   c) Animal susceptibility
   d) Fluorescent Microscopy.

SECTION – B (5X6 = 30 Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
   b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
   b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
   b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
   b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
   b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

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DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample

2. All the following are acid fast except,
   a) *Mycobacterium* b) *Actinomycetes* c) *Nocardia* d) *Staphylococci*

3. The common medium used for growing *M tuberculosis* is
   a) Blood agar b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli* b) *Klebsiella pneumoniae* c) *Proteus vulgaris* d) *Pseudomonas aeruginosa*

5. Selective medium for *Staphylococci* is a) EMB agar b) BSA c) MSA d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm b) 24mm c) 28mm d) 30mm

7. VDRL is an example for
   a) Agglutination b) Precipitation c) Complement fixation test d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (D) - negative b) are “universal recipients” of transfusion c) have circulating anti A and B antibodies d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen b) Antibody c) Antigen and Antibody d) None

10. Blotting of DNA is called
    a) Western blot b) Southern blot c) Northern blot d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”.(OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity.(OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case?(OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe? Where can one obtain such information? In this information available for all pathogens.(OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a) Entamoeba histolytica  b) Entamoeba coli  c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs  b) Larvae penetrating through the skin
   c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
    b) Name the specimen collected for dermatophytooses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
    b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — Plasmodium. (OR)
    b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
    b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
    b) Immunofluorescence — a technique to detect viral infections — Explain.
REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and
COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY
with Semester System
(with effect from 2007-2008)

1. Eligibility for Admission to the Course
Candidate for admission to the first year of the **B.Sc., Microbiology** degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. Duration of the Course
The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. Course of Study
The course of study for the UG degree courses of all branches shall consist of the following

a) **Part - I**
Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

The subject shall be offered during the first four semesters with one examination at the end of each semester.

b) **Part – II : English**
The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

c) **Foundation Course**
The Foundation course shall comprise of two stages as follows:
Foundation Course A : General Awareness (I & II semesters)
Foundation Course B : Environmental Studies (III & IV semesters)

The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
From the printed material supplied by the University - 75%
Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A:** Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester.

**Group B:** allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C:** application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D:** field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows:

A-Exemplary  
B-very good  
C-good  
D-fair  
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**
   a) A candidate will be permitted to appear for the university examinations for any semester if
      i) He/she secures not less than 75% of attendance in the number of working days during the semester.
      
      ii) He/she earns a progress certificate from the head of the institution, of having satisfactorily completed the course of study prescribed in the subjects as required by these regulations, and
      
      iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**
   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**
   The medium of instruction and examinations for the papers of Part I and II shall be the
   language concerned. For part III subjects other than modern languages, the medium of
   instruction shall be either Tamil or English and the medium of examinations is in English/Tamil
   irrespective of the medium of instructions. For modern languages, the medium of instruction and
   examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**
   Candidates appearing for practical examinations should submit bonafide Record Note
   Books prescribed for practical examinations, otherwise the candidates will not be permitted to
   appear for the practical examinations. However, in genuine cases where the students, who could
   not submit the record note books, they may be permitted to appear for the practical examinations,
   provided the concerned Head of the department from the institution of the candidate certified that
   the candidate has performed the experiments prescribed for the course. For such candidates who
   do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**
   a) A candidate who secures not less than 40% of the total marks in any subject including the
      Diploma and Foundation courses (theory or Practical ) in the University examination shall be
      declared to have passed the examination in the subject (theory or Practical ).
   
   b) A candidate who passes the examination in all the subjects of Part I, II and III (including
      the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**
   Candidates desirous of improving the marks awarded in a passed subject in their first
   attempt shall reappear once within a period of subsequent two semesters. The improved marks
   shall be considered for classification but not for ranking. When there is no improvement, there
   shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**
    a) A candidate who passes all the Part III examinations in the First attempt within a period
        of three years securing 75% and above in the aggregate of Part III marks shall be declared to have
        passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**
    
    b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma
        securing not less than 60 per cent of total marks for concerned part shall be declared to have
        passed that part in **First Class**
    
        (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma
            securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall
            be declared to have passed that part in **Second Class**
    
        (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part
            III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise /amend/ change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
### SCHEME OF EXAMINATIONS

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| Total|      | B.Sc., Microbiology                                                               | 3200                     | 400                     | 

* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I

CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining- Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, Mclntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I
Taxanomy – Principles – Modern approaches-Numeral I- Genetic, Serotaxonomy and Chemotaxonomy.

UNIT – II
Taxanomy of Eubacteria and Actinomycetes – Detailed classification upto genus level with general characters of each group – Bergey’s Manual and its importance.

UNIT – III
Taxanomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxanomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora ,Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount – LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References
SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids (glutamic acid family) – Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave , Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High speed, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT –III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radioimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT - III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References

SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application,-Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplasmic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose, Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles and Applications- conversion process

UNIT -III

UNIT -IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT -V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A.B). Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections - sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of
epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
*Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diptheriae.*

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive
Organisms- *Clostridium perfringens, Clostridium tetani.*

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative
organisms *Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.*

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- *Mycobacterium*
*Tuberculous, Mycobacterium lepbrae, Treponema pallidum, Leptospira, Chlamydias, Rickettsiae.*

References

1. Mackie and Mc catney, 1994, Medical Microbiology No I and II. Churchill Livingston, 14\textsuperscript{th} edition.
4. Bailey and Scotts, 1994, Diagnostic Microbiology, 9\textsuperscript{th} edition, Baron and Finegold CV Mosby Publications.
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT- I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References


SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumonias, Proteus, Salmonella* ,*Shigella, Pseudomonas, Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia*.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT – I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, Widal), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunoelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs
Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert koch  b) Louis Pasteur  c) Antony Von Leewenhock  d) Both b & c

2) Immunity mediated by antibodies are called as ________________
   a) Humoral  b) Cell mediated  c) Active  c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) ___________ is used as a counter stain in spare staining
   a) Safranin  b) Methylene blue  c) Malachite green  d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP  b) TDT  c) D  d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um  b) 0.3 um  c) 0.4 um  d) 0.5 um

7) McIntosh fieldes jar method is used for cultivating ________________
   a) Aerobic organisms  b) Anaerobic organisms  c) Facultative anaerobic organisms  d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar  b) EMB agar  c) Both a & b  d) None of the above.

9) TVC refers to ____________
   a) Total viable count  b) Total viral count  c) Total viable colony  c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant  b) Agar slant  c) Mineral oil overlay  d) a,b & c.

SECTION-B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theory of disease and to the treatment or prevention of diseases.  (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope  (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave.  (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques.  (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes.  (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - AnswerALLQuestions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II -MICROBIAL DIVERSITY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram (b) Similarity matrix (c) Dendrogram (d) None of the above
3. Which of the following is a motile bacterium
   (a) Escherichia coli (b) Klebsiella (c) Bacillus subtilis (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall (b) Colonies have fried egg appearance (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast (b) Plastid (c) Thylakoid (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens (b) Halophiles (c) Thermophiles (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores (b) Zygosporas (c) Basidiospores (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores (b) Zygosporas (c) Conidiospores (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae (b) Green algae (c) Blue green algae (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall (b) Move by flagella/pseudopodia
        (c) Unicellular (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? Explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.
14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium.
15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of Bergeys manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples.
19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Chlorophyta and phaeophyta. Or
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide + compounds (d) other compounds
2. Polarity flagellated bacteria is known as
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space

4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.

5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi

7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion

8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above

9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles

10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.

12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.

13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?

14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.

15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION–C(5X12=60Marks)

Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.

17. (a) Explain the structure and functions of Mitochondria and Chloroplast.. Or
    (b) Write a brief account on eukaryotic cell wall.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.

20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water         (b) Pigments        (c) Light        (d) H2S
2. Thiothrix thiooxidans is an example of----------
   (a) Chemoautotrophs   (b) Heterotrophs   (c) Photoautotrophs   (d) Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant     (b) Barotolerant   (c) Psychrophilic      (d) Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture   (b) Batch culture (c) Continous culture   (d) Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid     (b) Fumaric acid   (c) Lactic acid     (d) ketoglutaric acid
6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP   (b) ED   (c) HMP   (d) TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound   (b) Oxygen   (c) Nitrogenous compound   (d) Carbon dioxide
8. Which of the following carries out mixed acid fermentation?
   (a) Saccharomyces cerevisiae   (b) Chlorella sp   (c) Klebsiella sp   (d) Escherichia coli
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water     (b) Sunlight    (c) H2S     (d) O2
10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid   (b) Carbohydrate   (c) Protein   (d) None of the above

SECTION B (5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria.  Or
(b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth.  Or
(b) Give an account on Diauxic growth.
13. (a) Giving suitable example, describe substrate level phosphorylation.  Or
(b) Describe ED pathway.
14. (a) Describe alcoholic fermentation.  Or
(b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a) What is anoxygenic photosynthesis? Describe.  Or
(b) Give a brief note on Bioluminescence.

SECTION C (5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria.  Or
(b) With suitable examples, classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth.  Or
(b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs                                                        Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.
1. Hot air oven functions based on the principle of
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization  b. incineration  c. autoclave  d. oven.
3. Lyophilization is the
   a. separation of proteins     b. sudden freezing and dehydration
   c. enzyme reaction by oxidation             d. high pressure–segmentation.
4. The pH is defined as
   a. logH+   b. log2H+   c. -logH+   d. -log2H+
5. Which is used as an absorbent in TLC.
   a. KCl solution    b. lead sulphate    c. anions    d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid     b. lipid
   c. protein       d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solution b. nucleic acid
   c. proteins   d. enzymes.
8. NPK analysis is done using
   a. electrophoresi   b. centrifugation.
   c. flame photo  d. chromatography.
9. The pH of the blood is
   a. 6.3       b. 7.4       c. 7.0       d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION B(5X6=30Marks) - Answer ALL Questions.
11.a. With a schematic diagram, describe the working of a laminar flow chamber.       (or)
   .b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement.       (or)
   .b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography?       (or)
   .b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

 SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.
17.a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?
18.a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.
19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.
20.a. What is a buffer solution? State the common buffer compounds used in biology, with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs                                                  Maximum – 100 Marks

 SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV   b) Retrovirus  c) Pox         d) Bacteriophage
2) Which form of DNA is prevalent in living cells?
   a) A       b) B      c) C           d) Z
3) ----------- Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase  b) helicase  c) polymerase  d) primase
4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg c) Meselson &stahl  d) Hershey & Chase
5) ----------- no of codons constitute the coding dictionary
   a) 64       b) 61           c) 62       d) 60
6) CAP is involved in--------?  
   a) Catabolic repression  b) Induction  c) feed back inhibition  d) None of these

7) --------is an example for intercalating agent?  
   a) Acridine orange  b) EMS  c) Nitrous oxide  d) UV

8) Lex protein are involved in ----type of repair?  
   a) SOS  b) photoreactivation  c) Exision repair  d) all of the above

9) Davis-u-tube expt is used to prove the existance of--------?  
   a) Transformation  b) conjugation  c) transduction  d) recombination

10) Transformation was proved and demonstrated by-----  
     a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11) a) Elucidate the structure of DNA  OR  
     b) Discuss the characters of a genetic material

12) a) Prove that replication is semi conservative by a suitable experiment  OR  
     b) Describe DNA polymerase

13) a) Explain the features of genetic code  OR  
     b) Discuss attenuator control in trp operon

14) a) Discuss Ame’s test  OR  
     b) Discuss photoreactivation

15) a) Discuss briefly specialized transduction  OR  
     b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR  
     b) Explain the different forms of DNA

17) a) How the naked DNA is condensed and organized in a prokaryotic cell?  OR  
     c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved

18) a) List and explain the negatively controlled operon in E.Coli  OR  
     b) Describe the mechanism involved in the transformation of information from DNA to RNA

19) a) Explain how the organism protects its DNA from damage?  OR  
     b) Explain the phenomenon involved in generation of mutants?

20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene  OR  
     b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock   b) Robert Koch   c) Louis Pasteur   d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis   b) Hematopoiesis   c) Hemoglobin   d) None of the above.

3) ____________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody   b) Haptens   c) Adjuvants   d) Epitopes

4) ____________________ is the immunoglutin which can cross the placenta.
   a) IgA   b) IgD   c) IgM   d) IgG

5) Type I hypersensitivity is otherwise called as ________________
   a) Cell Stimulating   b) Delayed type   c) Anaphylactic   d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator   b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator   d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin   b) Agglutinin   c) Agglutinogen   d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand   b) Analyte   c) Both a & b   d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ____________
   a) Allografts   b) Autograft   c) Isograft   d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as __________
    a) Adoptive immunisation   b) Adaptive immunisation   c) Combined   d) None of the above.

SECTION B (5X6=30 Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION C (5X12=60 Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction.  
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system.  
   b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY

Duration – 3hrs  
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of  
   (a) lacti  (b) pyruvic acid  (c) fumaric acid  (d) aminoacids
2. All the following genera of bacteria produce pigments except  
   (a) Serratia  (b) Flavobacterium  (c) Micrococcus  (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of  
   (a)62.8C, 30 min  (b)62.5C,30 min  (c) 71.7C, 15 sec  (d) 71.7C, 15 min
4. Ropiness of bread is caused by species of  
   (a) Aspergillus  (b) Bacillus  (c) Saccharomyces  (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except  
   (a) beer  (b) sauerkraut  (c) soft drinks  (d) fruit juice
6. A can with a minute leak during storage is called a  
   (a) breather  (b) springer  (c) flipper  (d) sparger
7. The term leavening is associated with the preparation of  
   (a) soy sauce  (b) yoghurt  (c) bread  (d) cheese
8. All the following organisms contribute to acidity in idli batter except  
   (a) Leuconostoc mesenteroides  (b) Streptococcus faecalis  
   (c) Pediococcus cerevisiae  (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks  
   (a) collection of sample  (b) storage of sample at room temperature for 24 hr  
   (c) gathering information  (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is  
    (a) an enterotoxin  (b) a neurotoxin  (c) a hepatotoxin  (d) a nephrotoxin.

SECTION-B (5X6=30Marks) - Answer ALL Questions.

11a) What is the significance of molds in food microbiology? Describe.  
   b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation.  
   b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe.  
   b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce.  
   b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
   b) Give a brief account of food standards.

SECTION–C (5X12 = 60 Marks)
Answer ALL Questions.

16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
   b) What are the various factors that influence the growth of microorganisms in foods.

17a) Discuss the use of high temperature in food preservation. (or)
   b) Discuss the principles of food preservation.

18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
   b) Discuss the biological spoilage of canned foods.

19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
   b) With neat flow chart describe the production of cheese.

20a) Describe in detail about food borne infections caused by bacteria. (or)
   b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks

RECOMBINANT DNA TECHNOLOGY - I

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. GAATTC is the recognition sequence of
   (a) BamHI  (b) EcoRI  (c) HindIII  (d) HaeIII

2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase  (b) E.coli ligase  (c) Sal ligase  (d) All

3. Phosphoramidite method is used for the synthesis of
   (a) DNA  (b) Protein  (c) Phosphatase  (d) Phosphoric acid

4. Plasmids are DNA strands which are
   (a) Extrachromosomal  (b) Double stranded  (c) Self replicating  (d) All the above

5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  (c) M13 Phage  (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi.

7. Colony hybridization technique is employed for
   (a) Selection of vector  (b) Unhybridised ones  (c) Selection of desirable clones  (d) None of the above

8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation  (b) Microinjection  (c) Transformation  (d) None

9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus  (b) Thermus aquaticus
   (c) Thermobacter aquaticus(d) Thermus aquaticae

10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot  (b) Northern blot  (c) Western blot  (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or
   (b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or
   (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or
   (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or
   (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - AnswerALLQuestions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or
   (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or
   (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
   (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
   (b) How will you identify the presence of r DNA in a cell?.
20. (a) Explain Southern blotting technique and its applications. Or
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs
Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) ------------ are broad spectrum antiviral products
   a) Histones  b) IFN  c) Streptomycin  d) Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c) Xanthococcus  d) Zymomonas
3) ------------ is involved in the fusion of myloma cells with spleen cells
   a) PEG  b) PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as ------------
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) ------------ required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is ----------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c) Dinosaurs  d) Mice
8) __________ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) __________ marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION –B (5X5=25Marks) - Answer ALL Questions.

11a) Write a brief account on commercial biosynthesis of interferons (or)
    b) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application and development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development - explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION –C (5X8=40Marks) - Answer ALL Questions.

16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19) a) Discuss methodologies involved in the creation of transgenic mice also add
     brief note on its application (or)
    b) Discuss about transgenic - goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in ____________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a________________
   a. open culture system    b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at --------- stage of their growth.
   a. lag    b. log    c. stationary    d. decline
7. The term single –cell protein was coined at-------- in 1966
   a. CFTRI, Mysore    b. Massachusetts Institute of technology
   c. MTCC    d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol    b. methane    c. oil    d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery    b. quality control   c. sterilization   d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid   c. both   d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**
11.a. Discuss the significance of microbes in the production of commercially important products.
   (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture    (or)
   b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.    (or)
   b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making    (or)
   b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.    (or)
   b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**
16.a. Give a detailed account on the various methods of strain improvement    (or)
   b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.    (or)
   b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.    (or)
   b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.    (or)
   b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.    (or)
   b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is a) Ammensalism b) Commensalism c) Parasitism d) Synergism

2) Mycorhizal association is an example of a) Ammensalism b) Commensalism c) Parasitism d) Symbiosis

3) ------------ is an example of recalcitrant compound a) Lignin b) Protein c) Carbohydrate d) Lipid

4) Fermentation is an an example for ---------- degradation a) Aerobic b) Anaerobic c) a and b d) None of the above

5) ------------ is a cellulolytic bacteria a) Pseudomonas b) Klebsiella c) Mycoplasma d) Zymomonas

6) Rhizobium exist as ----------- in the nodules a) Protoplast b) Bacterioides c) Mycoplasma d) None of the above

7) Azospirillum is an example for a) Free living b) Symbiotic c) associative d) all the above

8) According to the American standard of potability ---------- number of E.coli can present in 100 ml of water a) 1 b) 0 c) 10 d) 100

9) Application of alum is in -------- phase of water treatment

10) Super Bug was developed and patented by-------- a) Khorana b) Kohnberg c) Chakraborthy d) Sanger

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)

b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)

b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)

b) Explain carbon cycle

14a) Discuss MPN technique (or)

b) Explain Eutrophication

15a) Describe Air pollution (or)

b) Explain the methodology involved in Microbiological Air quality

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)

b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)

b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)

b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)

b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)

b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV? (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) M. Theiler
2. The spikes are otherwise (a) Peplomers (b) Capsid (c) Envelope (d) Coat
3. The one step growth experiment was developed by (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is (a) T4 phage (b) MS2 (c) QB (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called (a) Conduction (b) Transfection (c) Insertion (d) Induction
6. The int gene codes for the synthesis of an enzyme (a) Integrase (b) Ligase (c) Excisionase (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA (b) Infectious ss RNA (c) Non – infectious ss DNA (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through (a) Endodesmata (b) Pore (c) Echodesmata (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane (b) cytoplasm (c) Nucleus (d) None of the above
10. For measles, the immunogen is (a) Active but attenuated (b) Inactive but attenuated (c) Inactive heat killed (d) Inactivated

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or (b) Give a brief outline on Rubella virus.

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs
Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease a. Malaria b. filariasis c. plaque d. all the above
2. Persons with symptomless infection is called
   a. immune b. carrier c. vector d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococci b. staphylococci c. Pseudomonas d. Vibrio
4. Toxigenecity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus b. Corynebacterium c. Clostridium d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease b. lock jaw c. hepatitis d. rabies
7. Food borne intoxication is caused by a. Salmonella b. E.coli c. Shigell d. Staphylococcus
8. Darting motility is seen with a. E.coli b. Streptococcus c. V.cholerae d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar b. BSA c. LJ d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces b. urine c. sputum d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a. Define and differentiate carriers. (or)
    b. State Koch postulates.
12. a. Give the features of Streptococcus. (or)
    b. Give the features of B.anthracis
13. a. Describe the methods for diagnosis to tetanus (or)
    b. Describe the methods for diagnosis of gas gangrene.
14. a. Write a short note on enteric fever. (or)
    b. Write a short note on bacillary dysentery.
15. a. Give the features of Chlamidiae. (or)
    b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16. a. Elucidate the methods of transmission of infection with examples. (or)
    b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17. a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
    b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18. a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19. a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20. a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II
Duration – 3hrs  maximum – 75 Marks
SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A tangled mass of hyphae is called as _______________
   a) Hypha  b) Mycelium  c) Mould  d) Fungi
2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci  b) P. notatum  c) Rhizopus  d) Mucor
3. Candidosis is caused mainly by _______________
   a) C. albicans  b) C. tropicalis  c) C. pseudotropicalis  d) C. krusei
4. The major organism which causes urinary tract infection is _______________
   a) E. coli  b) Salmonella  c) Shigella  d) Klebsiella
5. Traveller's diarrhea is caused by _______________
   a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli  d) Enterotoxigenic E.coli
6. Blue pus is caused by _______ a) Pseudomonas b) Vibrio   c) Salmonella   d) E. Coli
7. Sexually transmitted disease is caused by _______________
   a) Treponema b) Klebsiella c) Proteus   d) Pseudomonas
8. Invasion of microorganisms into the bloodstream is called as _______________
   a) Septicemia  b) bacteremia  c) Viremia  d) Algemia
9. MIC denotes _______________
   a) Maximum inhibitory concentration  b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration  d) None of the above
10. Endoflagella is a characteristic nature present in _______________
    a) Spirochetes b) Salmonella  c) Proteus   d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. a) Comment on superficial infection. (or)
    b) Describe candidiasis
12. a) Comment on Taenia solium    (or)  b) Give a brief note on Ascaris.
13. a) Describe the etiology and laboratory diagnosis of urinary tract infections.    (or)
    b) Describe respiratory tract infections.
14.a) Describe briefly on pyogenic infections.   (or)  b) Comment on Pseudomonas.
15.a) Explain the mechanism of drug resistance   (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.
16.a) Add a note on opportunistic fungal infections   (or)
    b) Aspergillosis Describe.
17.a) Describe Trichus trichura     (or)
    b) Comment on Wucheraria bancrofti
18.a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli   (or)
    b) Comment on pyogenic infections caused by Staphylococcus.
19.a) Comment on meningitis   (or)  b) Describe pyrexia
20.a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuart's medium  
   b) Glycerol saline medium  
   c) Cary Blair medium  
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne  
   b) Ingestion  
   c) Direct inoculation  
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True  
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid  
   b) Blood  
   c) Semen  
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol  
   b) Sputolyisin  
   c) Sputasol  
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol  
   b) Sodium hypochlorite  
   c) 2% Glutaraldehyde  
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium  
   b) Cooked meat medium  
   c) Saponin broth  
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA  
   b) ELISA  
   c) Western blot  
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium  
    b) Acid fast staining  
    c) Animal susceptibility  
    d) Fluorescent Microscopy.

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
   b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
   b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
   b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
   b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
   b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample

2. All the following are acid fast except,
   a) *Mycobacterium* b) *Actinomycetes* c) *Nocardia* d) *Staphylococci*

3. The common medium used for growing *M tuberculosis* is
   a) Blood agar b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics IMViC+++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli* b) *Klebsiella pneumoniae* c) *Proteus vulgaris* d) *Pseudomonas aeruginosa*

5. Selective medium for *Staphylococci* is a) EMB agar b) BSA c) MSA d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm b) 24mm c) 28mm d) 30mm

7. VDRL is an example for
   a) Agglutination b) Precipitation c) Complement fixation test d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh(D) - negative b) are “universal recipients” of transfusion c) have circulating anti A and B antibodies d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen b) Antibody c) Antigen and Antibody d) None

10. Blotting of DNA is called
    a) Western blot b) Southern blot c) Northern blot d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiologist determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe?
   Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria    b) Protozoa   c) Virus   d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida   c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon       b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic     d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium       b) Taenia saginata     c) Taenia corporis   d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica b) Entamoeba coil  c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs. b) Larvae penetrating through the skin
   b) c) Ingestion of larvae   d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar   b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA   b) IHA   c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg   b) HBsAg + HBcAg  c) HBsAg + Core antibody   d) HBcAg
10. Viruses are
   a) Found primarily in soil   b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar   d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing
    another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infection and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)  
   b) Name the specimen collected for dermatophytoses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)  
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — Plasmodium. (OR)  
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)  
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)  
   b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the **B.Sc., Microbiology** degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology / Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A:** Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester.

**Group B:** allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C:** application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D:** field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) Co-Curricular activities: NSS/NCC/Physical education
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

- A-Exemplary
- B-very good
- C-good
- D-fair
- E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

   a) A candidate will be permitted to appear for the university examinations for any semester if

   i) He/she secures not less than 75% of attendance in the number of working days during the semester.

   ii) He/she earns a progress certificate from the head of the institution, of having satisfactorily completed the course of study prescribed in the subjects as required by these regulations, and

   iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

(ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

(iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an 
institution approved by/affiliated to the University or has been exempted from in the manner 
prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a 
certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as 
evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the 
first attempt, within the minimum period prescribed for the course of study from the date of 
admission to the course and secures I or II class shall be eligible for ranking and such ranking 
will be confined to 10 % of the total number of candidates qualified in that particular branch of 
study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical 
shall be permitted to do so and such candidate shall join a college in the III year of the course 
and he/she will be permitted to appear for par III alone by granting exemption form appearing 
Part I, Part II and common allied subjects (if any), already passed by the candidate. And a 
candidate desirous to obtain an additional UG degree involving practical shall be permitted to 
do so and such candidate shall join a college in the II year of the course and he/she be permitted 
to appear for Part III alone by granting exemption form appearing for Part I, Part II and the 
common allied subjects. If any, already passed. Such candidates should obtain exemption from 
the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective 
courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each 
paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change 
for a minimum period of three years from the date of approval of the Regulations. The 
University may revise/amend/change the Regulations and Scheme of Examinations, if found 
necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will 
be permitted to take the Examinations under those Regulations for a period of four years i.e. up 
to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the 
Examination only under the Regulations in force at that time.
## SCHEME OF EXAMINATIONS

<table>
<thead>
<tr>
<th>Sem</th>
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<th>Instruction Hrs per week</th>
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<td>Gr A Core Paper I - Fundamentals of Microbiology</td>
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*NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I  
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I  

UNIT – II  
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_),Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III  

UNIT – IV  
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour,Spread, Streak and Micromanipulator.

UNIT – V  

References  
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II
Taxanomy of Eubacteria and Actinomycetes – Detailed classification upto genus level with general characters of each group – Bergey’s Manual and its importance.

UNIT – III
Taxanomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxanomy of Fungi (Alexopolous) - General Characteristics-Life Cycles of Mucor, Neurospora ,Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidophiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT – III


UNIT – IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application, -Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products- Proteins- Pharmaceuticals – Interferons - Human growth hormone - Antibiotics - Biopolymers.

UNIT –II

Vaccines – subunit vaccines – Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants- Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References
SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

 Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

 Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT - IV

 Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT - V

 Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V


References


SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms 
*Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diptheriae.*

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- *Clostridium perfringens, Clostridium tetani.*

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms *Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.*

UNIT -V
Morphology, pathogenicity and laboratory diagnosis- *Mycobacterium Tuberculosi, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydias, Rickettsiae.*

References
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT- I

UNIT -II

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- *Staphylococcus* and *Pseudomonas*: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References


SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of E. coli plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus and Streptococcus pyogenes.
6. Identification of clinically important fungi – Candida albicans, Cryptococcus neoformans and Aspergillus
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – Aspergillus, Mucor, Penicillium, Rhizopus
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – Entamoeba, Plasmodium, Ascaris, Taenia.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8\textsuperscript{th} edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs                                                         Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert koch       b) Louis Pasteur       c) Antony Von Leewenhock   d) Both b & c

2) Immunity mediated by antibodies are called as ________________
   a) Humoral           b) Cell mediated       c) Active                c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) _____________ is used as a counter stain in spare staining
   a) Safranin           b) Methylene blue     c) Malachite green      d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP               b) TDT                c) D                     d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um             b) 0.3 um            c) 0.4 um               d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms   b) Anaerobic organisms   c) Facultative anaerobic organisms   d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar    b) EMB agar           c) Both a & b            d) None of the above.

9) TVC refers to ____________
   a) Total viable count b) Total viral count   c) Total viable colony   d) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant         b) Agar slant         c) Mineral oil overlay    d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and Koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe Koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION-C (5X12=60Marks) - AnswerALLQuestions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease

17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.

18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.

19) a) Discuss the types of media with eg. for each. (or)
    b) Explain in detail about selective and differential media.

20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

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CORE PAPER II -MICROBIAL DIVERSITY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain  (b) Genus  (c) Species  (d) Group

2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram  (b) Similarity matrix  (c) Dendrogram  (d) None of the above

3. Which of the following is a motile bacterium
   (a) Esherichia coli  (b) Klebsiella  (c) Bacillus subtilis  (d) Staphylococcus aureus

4. All the following are true about Mycoplasma except
   (a) Lack cellwall  (b) Colonies have fried egg appearance  (c) Require sterols for growth
      (d) Their genome is one of the largest found in prokaryotes

5. The photosynthetic organelles in bacteria is
   (a) Chloroplast  (b) Plastid  (c) Thylakoid  (d) Pyrenoid

6. Bacteriorhodopsin is present in
   (a) Methanogens  (b) Halophiles  (c) Thermophiles  (d) Purple sulphur bacteria

7. The sexual spores formed by Agaricus is called
   (a) Ascospores  (b) Zygospor es  (c) Basidiospores  (d) Sporangiospores

8. All the following are asexual spores of fungi except
   (a) Sporangiospores  (b) Zygospor es  (c) Conidiospores  (d) Chlamydospores

9. The members of phaeophyta are commonly known as
   (a) Red algae  (b) Green algae  (c) Blue green algae  (d) Brown algae

10. All the following are true about protozoa except
    (a) All members have cellwall  (b) Move by flagella/pseudopodia
        (c) Unicellular  (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain.  Or  
(b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium.  Or  
(b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria.  Or  
(b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples
14. (a) Explain the life cycle of Mucor  Or  
(b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia.  Or  
(b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach  Or  
(b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe.  Or  
(b) Give a detailed account of Bergey's manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria.  Or  
(b) Classify the photosynthetic eubacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi.  Or  
(b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Chlorophyta and phaeophyta.  Or  
(b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria  
   (a) Peptidoglycan  (b) Lipopolysaccharide  
   (c) Peptidoglycan + Lipopolysaccharide + compounds  (d) other compounds

2. Polarly flagellated bacteria is known as -------------  
   (a) Lophotrichous  (b) Peritrichous  
   (c) Atrichous  (d) Axial filaments
3. Where does energy production occurs in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION–C(5X12=60Marks)

Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water    (b) Pigments    (c) Light    (d) H2S
2. Thiobacillus thiooxidans is an example of--------
   (a) Chemoautotrophs    (b) Heterotrophs    (c) Photoautotrophs    (d) Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant    (b) Barotolerant    (c) Psychrophilic    (d) Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture    (b) Batch culture    (c) Continuous culture    (d) Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid    (b) Fumaric acid    (c) Lactic acid    (d) Ketoglutaric acid
6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP    (b) ED    (c) HMP    (d) TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound    (b) Oxygen    (c) Nitrogenous compound    (d) Carbon dioxide
8. Which of the following carries out mixed acid fermentation?
   (a) Saccharomyces cerevisiae    (b) Chlorella sp    (c) Klebsiella sp    (d) Escherichia coli
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water    (b) Sunlight    (c) H2S    (d) O2
10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid    (b) Carbohydrate    (c) Protein    (d) None of the above

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.
13. (a) Giving suitable example, describe substrate level phosphorylation. Or
    (b) Describe ED pathway.
14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a) What is anoxygenic photosynthesis? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria. Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or 
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or 
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or 
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization   b. incineration   c. autoclave   d. oven.
3. Lyophilization is the
   a. separation of proteins   b. sudden freezing and dehydration   c. enzyme reaction by oxidation   d. high pressure–segmentation.
4. The pH is defined as
   a. logH+   b. log2H+   c. -logH+   d. -log2H+
5. Which is used as an absorbent in TLC.
   a. KCl solution   b. lead sulphate   c. anions   d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid   b. lipid   c. protein   d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solution   b. nucleic acid   c. proteins   d. enzymes.
8. NPK analysis is done using
   a. electrophoresis   b. centrifugation.   c. flame photo   d. chromatography.
9. The pH of the blood is
   a. 6.3   b. 7.4   c. 7.0   d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION B(5X6=30Marks) - Answer ALL Questions.
11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
.b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
.b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
.b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”

   (or)
   b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology. with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV b) Retrovirus c) Pox d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A b) B c) C d) Z

3) -----------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase  b) helicase c)polymerase d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad b) Tautam &Lederberg c) Meselson &stahl d) Hershey & Chase

5) --------- no of codons constitute the coding dictionary
   a) 64 b) 61 c) 62 d) 60
6) CAP is involved in--------------?
   a) Catabolic repression  b) Induction c) feed back inhibition  d) None of these
7) ------------is an example for intercalating agent?
   a) Acridine orange  b) EMS  c) Nitrous oxide  d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair  d) all of the above
9) Davis-u-tube expt is used to prove the existance of-------?
   a) Transformation  b) conjugation  c) transduction  d) recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA  OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment  OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code  OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test  OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction  OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?  OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli  OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?  OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene  OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs                         Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) __________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ______________ is the immunoglobin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ______________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as ______________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as __________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as __________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C(5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
    b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
    b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY
Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min (b) 62.5°C, 30 min (c) 71.7°C, 15 sec (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus (b) Bacillus (c) Saccharomyces (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather (b) springer (c) flipper (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce (b) yoghurt (c) bread (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides (b) Streptococcus faecalis
   (c) Pediococcus cerevisiae (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample (b) storage of sample at room temperature for 24 hr
   (c) gathering information (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

SECTION – B(5X6=30Marks) - Answer ALL Questions.
11a) What is the significance of molds in food microbiology? Describe. (or)
    b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
    b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
    b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
    b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria.  
   b) Give a brief account of food standards.

   SECTION–C(5X12=60Marks)
   Answer ALL Questions.

   16a) Discuss the importance of bacteria in food microbiology with suitable examples  
       (or)
   b) What are the various factors that influence the growth of microorganisms in foods.

   17a) Discuss the use of high temperature in food preservation. (or)
      b) Discuss the principles of food preservation.

   18a) Write in detail about any six types of organism responsible for spoilage of vegetables  
       (or)
   b) Discuss the biological spoilage of canned foods.

   19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
      b) With neat flow chart describe the production of cheese.

   20a) Describe in detail about food borne infections caused by bacteria. (or)
      b) What are mycotoxins? Describe in detail with suitable examples.

   APPLICATION ORIENTED PAPER - I
   Duration – 3hrs                                      Maximum – 75 Marks

   RECOMBINANT DNA TECHNOLOGY - I

   SECTION A ( 10 x 1= 10 Marks)
   Choose the correct answer for each from the FOUR alternatives given

   1. GAATTC is the recognition sequence of
      (a) BamHI    (b) EcoRI    (c) HindIII   (d) HaeIII
   2. An example of a ligase capable of both blunt and cohesive end ligation is
      (a) T4 ligase  (b) E.coli ligase  (c) Sal ligase  (d) All
   3. Phosphoramidite method is used for the synthesis of
      (a) DNA    (b) Protein    (c) Phosphatase  (d) Phosphoric acid
   4. Plasmids are DNA strands which are
      (a) Extrachromosomal  (b) Double stranded   (c) Self replicating  (d) All the above
   5. Insertional vectors are derived from
      (a) Bacterial plasmid  (b) Phage lambda  (c)M13 Phage (d) Yeast plasmid
   6. Cosmid are novel vector that combines the features of
      (a) Phage  (b) Plasmid  (c) Plasmid and phage (d) Fungi.
   7. Colony hybridization technique is employed for
      (a)Selection of vector  (b)Unhybridised ones  (c)Selection of desirable clones  (d)None of the above
   8. The introduction of DNA into a single eukaryotic cell with a fine needle
      (a) Electroporation  (b) Microinjection
      (c) Transformation   (d) None
   9. Taq polymerase is isolated from
      (a) Thermophilus aquaticus  (b) Thermus aquaticus
      (c) Thermobacter aquaticius(d) Thermus aquaticae
   10. Hybridization technique used to detect protein in a gel is
      (a) Southern blot  (b) Northern blot  (c) Western blot  (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning.  Or
   (b) Explain the action of Methylases.
12. (a) Write a note on YAC.  Or
   (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis.  Or
   (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone?  Or
   (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique.  Or
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses.  Or
   (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library.  Or
   (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  Or
   (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques.  Or
   (b) How will you identify the presence of r DNA in a cell?
20. (a) Explain Southern blotting technique and its applications.  Or
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs  aximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) -------- are broad spectrum antiviral products
   a) Histones  b)IFN  c) Streptomycin  d)Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c)Xanthococcus  d) Zymomonas
3) -------- is involved in the fusion of myloma cells with spleen cells
   a) PEG  b)PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as --------
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) -------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is --------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c)Dinosaurs  d) Mice
8) ------------ method is involved development of transgenic animal 
a) Microinjection  
b) Protoplast fusion  
c) Hybridoma technology  
d) b and c 
9) ------------ marker are involved in DNA Fingerprinting 
a) VNTR  
b) RFLP  
c) RAPD  
d) STR3
10) Father of HGP 
a) Francis Collins  
b) Venter  
c) James Watson  
d) Hunkapillar

SECTION – B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or) 
d) List the us Human growth hormone and brief on its commercial production 
12a) Give a short note on Antidiotype vaccine (or) 
b) List the uses and application of monoclonal antibodies 
13a) Explain in short the application ad development of transgenic sheep (or) 
b) Transgenic mice; DNA microinjection method of development- explain 
14a) Explain in short about Ti based cointegrate vectors (or) 
b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or) 
b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or) 
b) Discuss microbial synthesis of Biopolymers 
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or) 
b) Explain the method and application of gene therapy 
18a) Discuss about Microbial insecticides (or) 
b) Elucidate methods involved in generation of insect, virus, resistant plants
19) a) Discuss methodologies involved in the creation of transgenic mice also add 
brief note on its application (or) 
b) Discuss about transgenic- goat, pig, birds and fish 
20a) Write a detailed essay on DNA Fingerprinting and its application (or) 
b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during 
a. secondary screening  
b. strain improvement  
c. pilot scale  
d. commercial operation
2. Glutamic acid is used for 
a. feed supplement  
b. flavour enhancer  
c. ethanol production  
d. antibiotic fermentation
3. Steady state is achieved in ______________ fermentation. 
a. batch  
b. fed-batch  
c. continuous  
d. all
4. Batch culture is a________________
   a. open culture system   b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag      b. log      c. stationary      d. decline
7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore   b. Massachusetts Institute of technology
   c. MTCC   d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control   c. sterilization   d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid   c. both   d. none

**SECTION–B(5X6=30Marks)** - **Answer ALL Questions.**

11.a. Discuss the significance of microbes in the production of commercially important products.
   (or) b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture   (or)
   .b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.   (or)
   b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making   (or)
   b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.   (or)
   b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks)** - **Answer ALL Questions.**

16.a. Give a detailed account on the various methods of strain improvement   (or)
   b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.   (or)
   b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.   (or)
   b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.   (or)
   b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.   (or)
   b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) -------------- is an example of recalcitrant compound a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an an example for ---------- degradation a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) -------------- is a cellulolytic bacteria a) Pseudomonas  b) Klebsiella  c) Mycoplasma d) Zymomonas

6) Rhizobium exist as ------------ in the nodules a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability ---------- number of E.coli can present in 100 ml of water a) 1  b)0  c)10  d) 100

9) Application of alum is in ----------- phase of water treatment

10) Super Bug was developed and patented by ----------- a) Khorana  b) Kohnberg  c) Chakraborthy d) Sanger

SECTION B (5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
b) Explain carbon cycle

14a) Discuss MPN technique (or)
b) Explain Eutrophication

15a) Describe Air pollution (or)
b) Explain the methodology involved in Microbiological Air quality

SECTION C (5X12=60)Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs                                      Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given
1. Who discovered the TMV?  (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) M. Theiler
2. The spikes are otherwise  (a) Peplomers  (b) Capsid  (c) Envelope  (d) Coat
3. The one step growth experiment was developed by
   (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is  (a) T4 phage  (b) MS2  (c) QB  (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called
   (a) Conduction  (b) Transfection  (c) Insertion  (d) Induction
6. The int gene codes for the synthesis of an ------------ enzyme
   (a) Integrase  (b) Ligase  (c) Excisionase  (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called
   (a) Non – infectious ss RNA  (b) Infectious ss RNA
   (c) Non – infectious ss DNA  (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through
   (a) Endodesmata  (b) Pore  (c) Echodesmata  (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on
   (a) Plasma membrane  (b) cytoplasm  (c) Nucleus  (d) None of the above
10. For measles, the immunogen is
    (a) Active but attenuated  (b) Inactive but attenuated  (c) Inactive heat killed  (d) Inactivated

SECTION B (5x6=30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region.  Or
    (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment.  Or
    (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage.  Or
    (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell.  Or
    (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS.  Or
    (b) Give a brief outline on Rubella virus.

SECTION C (5x12=60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods.  Or
    (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage.  Or
    (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny.  Or
    (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses.  Or
    (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus.  Or
    (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs  Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease  a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called
   a. immune  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
4. Toxigenecity of C. diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E. coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with  a. E. coli  b. Streptococcus  c. V. cholerae  d. S. typhi
9. Which one of the following media is used for the cultivation of M. leprae
   a. SS agar  b. BSA  d. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces  b. urine  c. sputum  d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers.  (or)
     b. State Koch postulates.
12.a. Give the features of Streptococcus.  (or)
     b. Give the features of B. anthracis
13.a. Describe the methods for diagnosis to tetanus  (or)
     b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever.  (or)
     b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidiae.  (or)
     b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples.  (or)
     b. As a microbiologist how would you take up an investigation of epidemics? Add a note
        on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How
      would you diagnose the same?  (or)
     b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C. tetani.  (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of C. perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E. coli.  (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of V. cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T. pallidum.  (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ______________
   a) Hypha    b) Mycelium    c) Mould    d) Fungi

2. _______________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci        b) P. notatum        c) Rhizopus    d) Mucor

3. Candidosis is caused mainly by ____________
   a) C. albicans  b) C. tropicalis    c) C. pseudotropicalis  d) C. krusei

4. The major organism which causes urinary tract infection is ______________
   a) E. coli        b) Salmonella        c) Shigella    d) Klebsiella

5. Traveller's diarrhea is caused by ______________
   a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli    d) Enterotoxigenic E.coli

6. Blue pus is caused by ______
   a) Pseudomonas    b) Vibrio    c) Salmonella    d) E. Coli

7. Sexually transmitted disease is caused by ______________
   a) Treponema  b) Klebsiella  c) Proteus    d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as___________
   a) Septicemia    b) bacteremia    c) Viremia    d) Algemia

9. MIC denotes ______________
   a) Maximum inhibitory concentration    b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration    d) None of the above

10. Endoflagella is a characteristic nature present in _____________
    a) Spirochetes  b) Salmonella    c) Proteus  d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium   (or)    b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14.a) Describe briefly on pyogenic infections. (or)  b) Comment on Pseudomonas.

15.a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16.a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17.a) Describe Trichus trichura (or)
    b) Comment on Wucheraria bancrofti

18.a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19.a) Comment on meningitis (or)    b) Describe pyrexia

20.a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs                                          Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients’ blood and body fluid specimens.
   d) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium  
   b) Glycerol saline medium  
   c) Cary Blair medium  
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne  
   b) Ingestion  
   c) Direct inoculation  
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True  
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid  
   b) Blood  
   c) Semen  
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol  
   b) Sputolysin  
   c) Spustasol  
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol  
   b) Sodium hypochlorite  
   c) 2% Glutaraldehyde  
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium  
   b) Cooked meat medium  
   c) Saponin broth  
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA  
   b) ELISA  
   c) Western blot  
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium  
    b) Acid fast staining  
    c) Animal susceptibility  
    d) Fluorescent Microscopy.

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
   b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
   b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
   b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
   b) State the special precautions necessary to process a sputum sample suspected for the presence of \textit{Mycobacterium tuberculosis}.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
   b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs 
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given:

1. The urine sample collected for microbiological analysis should be
   a) First voided urine  b) Mid stream urine  c) Urine form catheter bag  d) Early morning urine sample

2. All the following are acid fast except,
   a) \textit{Mycobacterium}   b) \textit{Actinomycetes}   c) \textit{Nocardia}   d) \textit{Staphylococci}

3. The common medium used for growing \textit{M tuberculosis} is
   a) Blood agar  b) Mac conkey agar  c) Lowenstein Jensen’s medium  d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) \textit{E. coli}   b) \textit{Kiebsiella pneumoniae}   c) \textit{Proteus vulgaris}   d) \textit{Pseudomonas aeruginosa}

5. Selective medium for \textit{Staphylococci} is  a) EMB agar  b) BSA  c) MSA  d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm

7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion  c) have circulating anti A and B antibodies  d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None

10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe?
    Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Growth medium for fungus inhibits growth of
   a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica  b) Entamoeba coil  c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs  b) Larvae penetrating through the skin
   c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
     c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing.(OR)
   b) Name the specimen collected for dermatophytoses. Is it necessary to store such specimens?
   How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male?(OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium.* (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis.(OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the **B.Sc., Microbiology** degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology / Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75% 
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) **Part – III**

**Group A**: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application–oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme**:  
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**

Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary  
B-very good  
C-good  
D-fair  
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

a) A candidate will be permitted to appear for the university examinations for any semester if
   
i) He/she secures not less than 75% of attendance in the number of working days during the semester.
   
   ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and
   
   iii) His/her conduct has been satisfactory.

Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**  
The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**  
Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**  
   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).
   
b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**  
Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**  
   a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

   b)  
      (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

      (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

      (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10 % of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise /amend/ change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
## SCHEME OF EXAMINATIONS

<table>
<thead>
<tr>
<th>Sem</th>
<th>Part</th>
<th>Subject and Paper</th>
<th>Hours per week</th>
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<th>Max Marks</th>
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| VI  | III  | Gr A Core Paper IX- Fermentation Technology | 4 | 3 | 100 |
|     |      | Core Paper X- Environmental and Agricultural Microbiology | 4 | 3 | 100 |
|     |      | Core Paper XI – Virology | 4 | 3 | 100 |
|     |      | Core Practical III | 6 | 9 | 150+50* |
|     |      | Gr C Appl Oriented Subject II Medical Microbiology - I | 3 | 3 | 75 |
|     |      | Gr C Appl Oriented Subject II Medical Microbiology – II | 3 | 3 | 75 |
|     |      | Diploma in Diagnostic Microbiology – Practical I | 3 | 3 | 50 |
|     |      | Diploma in Diagnostic Microbiology – Practical II | 3 | 3 | 50 |
|     |      | Diploma in Diagnostic Microbiology | 3 | 3 | 50 |

| Total | | | 3200 |
|       | | | 400 |

* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I: FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour,Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaeabacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaeabacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT – III


UNIT – IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA—the genetic material, RNA—the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA—replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions -agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV

Fermented food – pickled cucumber, saurkraut, soysauce, Bread, Idli – Fermented dairy products – Yoghurt and cheese.

UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V  
APPLICATION ORIENTED SUBJECT - I  
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I  
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II  
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III  
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV  
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V  
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application,-Microarray.

References


SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application , Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References

SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I

Early development of virology – general properties of viruses- cultivation of Viruses- virus purification and assays. The structure of viruses- virion size-
General structure properties- helical capsids, icosohedral capsid- nucleic acids-
Viral envelopes and enzymes- virus classification.

UNIT- II

Reproduction of DNA phages- ds DNA lytic phages- lytic cycle of T4 phage
The one step growth- adsorption to the host cell and penetration- synthesis of Phage nucleic acids and protein assembly of phage particles- release of phage particles. Example of ss DNA phage- OX 174- circle replication.

UNIT-III

Lysogeny- temperate bacteriophages- lambda phage- induction of lysogens-

UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A.B).
Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References
SEMESTER - VI  
APPLICATION ORIENTED SUBJECT - II  
MEDICAL MICROBIOLOGY - I

**UNIT- I**
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

**UNIT- II**
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms *Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diptheriae*.

**UNIT- III**
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- *Clostridium perfringens, Clostridium tetani*.

**UNIT- IV**
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms *Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae*.

**UNIT -V**
Morphology, pathogenicity and laboratory diagnosis- *Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydia, Rickettsia*.

**References**

5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT- I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancroftii, Enterobius, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References


SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization – Demonstration
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia.*
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I
Diagnostic microbiology – Purpose and philosophy. Purpose of diagnostic microbiology –

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to
microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology,
Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV
Laboratory organization and quality assurance – specimen procurement and identification –
laboratory requisition form – reporting results – procedure manual – Quality assurance and
statistics.

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection –
speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chee brough
(ELBS) Tropical health technology butter worth’s, 1985.

medical publications USA.

SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I
Selection, collection and transport of specimens – Blood, Urine, Sputum, CSF, Pus & Faeces –
transport media and storage. Microscopic examination of specimen for Bacterial pathogens –
simple, differential staining and motility.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment
and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment
and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and
interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL),
Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion,
Immunoelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid
hybridization, PCR and blotting in diagnosis.

References

   Company.
   Hyderabad.
3. Medical laboratory manual for tropical countries. Microbiology by Monica chees brough
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunoelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs                           Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert Koch  b) Louis Pasteur  c) Antony Von Leewenhock  d) Both b & c

2) Immunity mediated by antibodies are called as ________________
   a) Humoral   b) Cell mediated   c) Active   c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) ___________ is used as a counter stain in spare staining
   a) Safranin   b) Methylene blue   c) Malachite green   d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP   b) TDT   c) D   d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um   b) 0.3 um   c) 0.4 um   d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms   b) Anaerobic organisms   c) Facultative anaerobic organisms   d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar   b) EMB agar   c) Both a & b   d) None of the above.

9) TVC refers to ________________
   a) Total viable count   b) Total viral count   c) Total viable colony   c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant   b) Agar slant   c) Mineral oil overlay   d) a,b & c.

SECTION-B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO2 liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY
Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram (b) Similarity matrix (c) Dendrogram (d) None of the above
3. Which of the following is a motile bacterium
   (a) Esherichia coli (b) Klebsiella (c) Bacillus subtilis (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall (b) Colonies have fried egg appearance (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast (b) Plastid (c) Thylakoid (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens (b) Halophiles (c) Thermophiles (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores (b) Zygosporae (c) Basidiospores (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores (b) Zygosporae (c) Conidiospores (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae (b) Green algae (c) Blue green algae (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall (b) Move by flagella/pseudopodia
       (c) Unicellular (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or
(b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
(b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
(b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples
14. (a) Explain the life cycle of Mucor Or
(b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or
(b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
(b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
(b) Give a detailed account of Bergey's Manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
(b) Classify the photosynthetic eubacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi. Or
(b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or
(b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY
Duration – 3hrs Maximum – 100 Marks
SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds
2. Polarly flagellated bacteria is known as ----------
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occurs in eukaryotes?
   (a) Cytoplasmic membrane  (b) Mitochondria  
   (c) Polyphosphate granules  (d) Periplasmic space

4. Features of nuclear envelope includes
   (a) Ribosomes  (b) A double membrane structure  
   (c) Communication with cytoplasm  (d) Both b & c.

5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  
   (c) M13 Phage  (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi

7. Linked transport of two substances in the same direction is called
   (a) Antiport  (b) Facilitated diffusion  (c) Symport  (d) Passive diffusion

8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells  (b) Prokaryotic cells  (c) Both a & b  (d) None of the above

9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles  (b) Extreme thermophiles  (c) Acidophiles  (d) Osmophiles

10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage  (b) Ether linkage  (c) B 1-4 linkage  (d) Ionic linkage

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**

11. (a) Describe the capsule and slime layer of prokaryotic cell.  Or
    (b) Write a note on reserve materials.

12. (a) Explain the structure and functions of Endoplasmic reticulum.  Or
    (b) Write short notes on Nucleus.

13. (a) Give an account on cDNA synthesis.  Or
    (b) How will you purify plasmid DNA?

14. (a) Explain Facilitated diffusion.  Or
    (b) Write a note on phagocytosis and pinocytosis.

15. (a) Write a note on cell wall of Archaebacteria.  Or
    (b) What are methanogens? Exemplify the role with examples.

**SECTION–C(5X12=60Marks)
Answer ALL Questions.**

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization.  Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.

17. (a) Explain the structure and functions of Mitochondria and Chloroplast..  Or
    (b) Write a brief account on eukaryotic cell wall.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  Or
    (b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Write a brief note on active transport of nutrients in a bacterial cell.  Or
    (b) Give a brief account on group translocation mechanism.

20. (a) Give a brief account on Halophiles.  Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                                           Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water               (b) Pigments                (c) Light               (d) H2S

2. *Thiobacillus thiooxidans* is an example of----------
   (a) Chemoautotrophs    (b) Heterotrophs    (c) Photoautotrophs    (d) Copiotrophs

3. The organisms which tolerate high pressure are called
   (a) Halotolerant      (b) Barotolerant     (c) Psychrophilic      (d) Thermotolerant

4. Chemostat is associated with
   (a) Synchronous culture   (b) Batch culture   (c) Continuous culture   (d) Diauxic growth

5. All the following are intermediates of TCA cycle except
   (a) Citric acid       (b) Fumaric acid    (c) Lactic acid insertion   (d) Ketoglutaric acid

6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP               (b) ED                     (c) HMP               (d) TCA cycle

7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound  (b) Oxygen           (c) Nitrogenous compound   (d) Carbon dioxide

8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*  (b) *Chlorella* sp  (c) *Klebsiella* sp  (d) *Escherichia coli*

9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water            (b) Sunlight         (c) H2S                (d) O2

10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid            (b) Carbohydrate    (c) Protein            (d) None of the above

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.

12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.

13. (a) Giving suitable example, describe substrate level phosphorylation. Or
    (b) Describe ED pathway.

14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.

15. (a) What is anoxygenic photosynthesis? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION – C (5X12=60 Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria. Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.

17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or (b) What is oxidative phosphorylation? Describe.

19. (a) Explain briefly the propionic acid fermentation. Or (b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.

20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or (b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.

2. Moist heat sterilization is achieved by
   a. lyophilization  b. incineration  c. autoclave  d. oven.

3. Lyophilization is the
   a. separation of proteins  b. sudden freezing and dehydration  
   c. enzyme reaction by oxidation  d. high pressure–segmentation.

4. The pH is defined as
   a. logH^+  b. log2H^-  c. -logH^+  d. -log2H^- 

5. Which is used as an absorbent in TLC.
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel

6. SDS-PAGE is used to separate
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.

7. UV light is significantly absorbed by
   a. coloured solutio  b. nucleic acid  
   c. proteins  d. enzymes.

8. NPK analysis is done using
   a. electrophoresi  b. centrifugation.  
   c. flame photo  d. chromatography.

9. The pH of the blood is
   a. 6.3  b. 7.4  c. 7.0  d. 7.6

10. What is the normality of 5M NaOH solution?

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
   .b. Explain the working of an incubator.

12.a. Explain the electrodes used in pH measurement. (or)
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.

13.a. What is paper chromatography? (or)
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
   b. Write a note on NPK analysis.
15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of
   ammonium sulphate at 0°C is 706g/100g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 %
   saturated” solution to bring it to “60% saturation.”
   (or)
   b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Discuss the principle, types and applications of centrifuge. (or)
   b. Describe the instruments used for wet and dry sterilization.
17.a. Describe the different types of biosensors and their applications. (or)
   b. What is lyophilization? How is it done in the laboratory? What are its applications?
18.a. Explain Ion exchange chromatography. (or)
   b. Discuss the principle and methodology of affinity chromatography.
19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-
   Visible spectrophotometer over a special colorimeter? (or)
   b. Discuss the principle and applications of turbidometry.
20.a. What is a buffer solution? State the common buffer compounds used in biology.
   with their applications (or)
   b. Explain about the concentrations based on volume - molarity and normality. Also explain
   how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs
Maximum – 100 Marks

SECTIOIN A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) Experiments was conducted in ------- to prove that the RNA also act as genetic
   material
   a) TMV     b) Retrovirus   c) Pox     d) Bacteriophage
2) Which form of DNA is prevalent in living cells?
   a) A      b) B     c) C     d) Z
3) -----------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase   b) helicase   c)polymerase   d) primase
4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg c) Meselson &stahl   d) Hershey & Chase
5) ----------- no of codons constitute the coding dictionary
   a) 64   b) 61   c) 62   d) 60
6) CAP is involved in---------?
   a) Catabolic repression  b) Induction c) feed back inhibition       d) None of these
7) ----------is an example for intercalating agent?
   a) Acridine orange  b) EMS   c) Nitrous oxide         d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS     b) photoreactivation  c) Exision repair d) all of the above
9) Davis-u-tube expt is used to prove the existence of--------?
   a) Transformation  b) conjugation   c) transduction d) recombination
10) Transformation was proved and demonstrated by-----
   a) Griffith      b) Sanger     c) Grick        d) Watson

SECTION-B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA      OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment     OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code      OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test                     OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction OR
    b) Describe Holiday model of recombination

SECTION-C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material   OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?         OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli        OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?          OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene
    OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs                                             Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) __________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) __________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator  
      c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non-identical members of the same species are called as __________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as __________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)

    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)

    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)

    b) Comment on autoimmune disorders.

14) a) Giva a brief note on RIA (or)

    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)

    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)

    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)

    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)

    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY
Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti            (b) pyruvic acid           (c) fumaric acid       (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia        (b) Flavobacterium        (c) Micrococcus         (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min   (b) 62.5°C, 30 min     (c) 71.7°C, 15 sec      (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus     (b) Bacillus            (c) Saccharomyces        (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer           (b) sauerkraut         (c) soft drinks          (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather       (b) springer          (c) flipper             (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce      (b) yoghurt          (c) bread               (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides  (b) Streptococcus faecalis
   (c) Pediococcus cerevisiae     (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample     (b) storage pf sample at room temperature for 24 hr
   (c) gathering information    (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin       (b) a neurotoxin    (c) a hepatotoxin        (d) a nephrotoxin.

SECTION B(5X6=30Marks) - Answer ALL Questions.
11a) What is the significance of molds in food microbiology? Describe. (or)
    b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
    b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
    b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
    b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)

b) Give a brief account of food standards.

**SECTION–C(5X12=60Marks)**

**Answer ALL Questions.**

16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)

b) What are the various factors that influence the growth of microorganisms in foods.

17a) Discuss the use of high temperature in food preservation. (or)

b) Discuss the principles of food preservation.

18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)

b) Discuss the biological spoilage of canned foods.

19a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)

b) With neat flow chart describe the production of cheese.

20a) Describe in detail about food borne infections caused by bacteria. (or)

b) What are mycotoxins? Describe in detail with suitable examples.

**APPLICATION ORIENTED PAPER - I**

Duration – 3hrs

Maximum – 75 Marks

**RECOMBINANT DNA TECHNOLOGY - I**

**SECTION A ( 10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. GAATTC is the recognition sequence of
   (a) BamHI   (b) EcoRI   (c) HindIII   (d) HaeIII

2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase   (b) E.coli ligase   (c) Sal ligase   (d) All

3. Phosphoramidite method is used for the synthesis of
   (a) DNA   (b) Protein   (c) Phosphatase   (d) Phosphoric acid

4. Plasmids are DNA strands which are
   (a) Extrachromosmal   (b) Double stranded   (c) Self replicating   (d) All the above

5. Insertional vectors are derived from
   (a) Bacterial plasmid   (b) Phage lambda   (c) M13 Phage   (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of
   (a) Phage   (b) Plasmid   (c) Plasmid and phage   (d) Fungi.

7. Colony hybridization technique is employed for
   (a) Selection of vector   (b) Unhybridised ones   (c) Selection of desirable clones   (d) None of the above

8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation   (b) Microinjection
   (c) Transformation   (d) None

9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus   (b) Thermus aquaticus
   (c) Thermobacter aquaticus(d) Thermus aquaticae

10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot   (b) Northern blot   (c) Western blot   (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or
(b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or
(b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or
(b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or
(b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or
(b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or
(b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or
(b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
(b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
(b) How will you identify the presence of r DNA in a cell?
20. (a) Explain Southern blotting technique and its applications. Or
(b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs
aximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) ----------- are broad spectrum antiviral products
   a) Histones  b)IFN  c) Streptomycin  d)Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c)Xanthococcus  d) Zymomonas
3) ----------- is involved in the fusion of myloma cells with spleen cells
   a) PEG  b)PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as -----------
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) ----------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is -----------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c)Dinosaurs  d) Mice
8) ------------ method is involved development of transgenic animal
   a) Microinjection    b) Protoplast fusion    c) Hybridoma technology    d) b and c
9) -------------- marker are involved in DNA Fingerprinting
   a) VNTR    b) RFLP    c) RAPD    d) STR3
10) Father of HGP
    a) Francis Collins    b) Venter    c) James Watson    d) Hunkapillar

SECTION–B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
    d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application ad development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION–C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19) a) Discuss methodologies involved in the creation of transgenic mice also add
      brief note on its application (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening    b. strain improvement    c. pilot scale    d. commercial operation
2. Glutamic acid is used for
   a. feed supplement    b. flavour enhancer    c. ethanol production    d. antibiotic fermentation
3. Steady state is achieved in ____________ fermentation.
   a. batch    b. fed-batch    c. continuous    d. all
4. Batch culture is a________________
   a. open culture system   b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag   b. log   c. stationary   d. decline
7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore   b. Massachusetts Institute of technology
   c. MTCC   d. Imperial chemical Industries.
8. ___________ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control   c. sterilization   d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid   c. both   d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**
11.a. Discuss the significance of microbes in the production of commercially important products.
    (or) b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture   (or)
    .b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.   (or)
    b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making   (or)
    b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.   (or)
    b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**
16.a. Give a detailed account on the various methods of strain improvement   (or)
    b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.   (or)
    b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.   (or)
    b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.   (or)
    b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.   (or)
    b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is a) Ammensalism b) Commensalism c) Parasitism d) Synergism

2) Mycorhizal association is an example of a) Ammensalism b) Commensalism c) Parasitism d) Symbiosis

3) ----------------- is an example of recalcitrant compound a) Lignin b) Protein c) Carbohydrate d) Lipid

4) Fermentation is an example for ----------- degradation a) Aerobic b) Anaerobic c) a and b d) None of the above

5) ----------------- is a cellulosolytic bacteria a) Pseudomonas b) Klebsiella c) Mycoplasma d) Zymomonas

6) Rhizobium exist as ----------- in the nodules a) Protoplast b) Bacterioides c) Mycoplasma d) None of the above

7) Azospirillum is an example for a) Free living b) Symbiotic c) Associative d) All the above

8) According to the American standard of potability ----------- number of E.coli can present in 100 ml of water a) 1 b) 0 c) 10 d) 100

9) Application of alum is in ----------- phase of water treatment

10) Super Bug was developed and patented by a) Khorana b) Kohnberg c) Chakraborthy d) Sanger

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or) b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or) b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or) b) Explain carbon cycle

14a) Discuss MPN technique (or) b) Explain Eutrophication

15a) Describe Air pollution (or) b) Explain the methodology involved in Microbiological Air quality

SECTION – C (5X12=60Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or) b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or) b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or) b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or) b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or) b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

1. Who discovered the TMV? (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) M. Theiler
2. The spikes are otherwise (a) Peplomers (b) Capsid (c) Envelope (d) Coat
3. The one step growth experiment was developed by (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is (a) T4 phage (b) MS2 (c) QB (d) OX 174
5. The process of release of the prophage from the bacterial DNA is called (a) Conduction (b) Transfection (c) Insertion (d) Induction
6. The int gene codes for the synthesis of an (a) Integrase (b) Ligase (c) Excisionase (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA (b) Infectious ss RNA (c) Non – infectious ss DNA (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through (a) Endodesmata (b) Pore (c) Echodesmata (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane (b) Cytoplasm (c) Nucleus (d) None of the above
10. For measles, the immunogen is (a) Active but attenuated (b) Inactive but attenuated (c) Inactive heat killed (d) Inactivated

SECTION – B (5X6=30 Marks) - Answer ALL Questions.
11. (a) Give an account on cultivation of viruses in egg yolk region. Or (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or (b) Give a brief outline on Rubella virus.

SECTION – C (5X12=60 Marks) - Answer ALL Questions.
16. (a) Give a detailed account on viral purification and assay methods. Or (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs  Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called
   a. immuned  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
4. Toxigenecity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with  a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar  b. BSA  d. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces  b. urine  c. sputum  d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers. (or)
    b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)
    b. Give the features of B.anthracis
13.a. Describe the methods for diagnosis to tetanus (or)
    b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)
    b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidia. (or)
    b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples. (or)
    b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
    b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs
Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangle mass of hyphae is called as ________________
   a) Hypha  
   b) Mycelium  
   c) Mould  
   d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci  
   b) P. notatum  
   c) Rhizopus  
   d) Mucor

3. Candidosis is caused mainly by ________________
   a) C. albicans  
   b) C. tropicalis  
   c) C. pseudotropicalis  
   d) C. krusei

4. The major organism which causes urinary tract infection is ________________
   a) E. coli  
   b) Salmonella  
   c) Shigella  
   d) Klebsiella

5. Traveller's diarrhea is caused by ________________
   a) Enteropathogenic E. coli  
   b) Enterotoxigenic E. coli  
   c) Enteroinvasive E. coli  
   d) Enterotoxigenic E.coli

6. Blue pus is caused by ________
   a) Pseudomonas  
   b) Vibrio  
   c) Salmonella  
   d) E. coli

7. Sexually transmitted disease is caused by ________________
   a) Treponema  
   b) Klebsiella  
   c) Proteus  
   d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as ________________
   a) Septicemia  
   b) bacteremia  
   c) Viremia  
   d) Algemia

9. MIC denotes ________________
   a) Maximum inhibitory concentration  
   b) Minimum inhibitory concentration  
   c) Multiple inhibitory concentration  
   d) None of the above

10. Endoflagella is a characteristic nature present in ________________
    a) Spirochetes  
    b) Salmonella  
    c) Proteus  
    d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium  (or)  b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or)  b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17. a) Describe Trichusis trichura  (or)  b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis (or)  b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria  
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs                                                      Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuart's medium  b) Glycerol saline medium  c) Cary Blair medium  d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne  b) Ingestion  c) Direct inoculation  d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True  b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid  b) Blood  c) Semen  d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol  b) Sputolysin  c) Sputasol  d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol  b) Sodium hypochlorite  c) 2% Glutaraldehyde  d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium  b) Cooked meat medium  c) Saponin broth  d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA  b) ELISA  c) Western blot  d) PCR

10. For detection of *Mycobacterium tuberculosis*, the most sensitive and rapid method is
    a) Culturing on LJ medium  b) Acid fast staining  c) Animal susceptibility  d) Fluorescent Microscopy.

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions.(OR)
  b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
  b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory.(OR)
  b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
  b) State the special precautions necessary to process a sputum sample suspected for the presence of Mycobacterium tuberculosis.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens?(OR)
  b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs  
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine.  b) Mid stream urine  c) Urine form catheter bag  d) Early morning urine sample

2. All the following are acid fast except,
   a) Mycobacterium  b) Actinomycetes  c) Nocardia  d) Staphylococci

3. The common medium used for growing M tuberculosis is
   a) Blood agar  b) Mac conkey agar  c) Lowenstein Jensen’s medium  d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) E. coli  b) Klebsiella pneumoniae  c) Proteus vulgaris  d) Pseudomonas aeruginosa

5. Selective medium for Staphylococci is
   a) EMB agar  b) BSA  c) MSA  d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm

7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies  d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None

10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.
11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.
12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.
13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.
14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.
15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.
17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.
18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.
19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.
20. a) What information is essential for the design of a pathogen specific nucleotide probe?
     Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II  
MYCOLOGY, PARASITOLOGY AND VIROLOGY  

Duration – 3hrs  Maximum – 100 Marks  

SECTION A (10 x 1= 10 Marks)  
Choose the correct answer for each from the FOUR alternatives given  
1. Growth medium for fungus inhibits growth of  
   a) Bacteria  b) Protozoa  c) Virus  d) helminth  
2. Germ tube technique is used to identify  
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor  
3. Following are true of Giardiasis except,  
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum  
   c) CFT is diagnostic  d) stools contain only cysts.  
4. Ingestion of contaminated pork may lead to infections of  
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis  
5. Of the following organisms, which has a bigger size?  
   a,) Entamoeba histolytica  b) Entamoeba col  c) Entamoeba hartmanni  d) Escherichia coil.  
6. Hookworm infection is by  
   a) Ingestion of embryonated eggs.  b) Larvae penetrating through the skin  
   b)  c) Ingestion of larvae  d) the bite of insects  
7. Viruses can be cultivated is  
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth  
8. Which of the following is most specific in diagnosis of AIDS?  
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth  
9. The serobiological marker of acute Hepatitis B infection is  
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg  
10. Viruses are  
    a) Found primarily in soil  b) Obligate intracellular parasites  
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.  

SECTION–B(5X6=30Marks) - Answer ALL Questions.  

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)  
   b) Name the different media used for fungal pathogen isolation and identification.  
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)  
   b) Add a note on media for parasite isolation.  
13. a) Why do most protozoan diseases occur in the tropics. (OR)  
   b) How do infections caused by Entamoeba histolytica occur?  
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)  
   b) Describe some clinical manifestations caused by the acute respiratory viruses.  
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)  
   b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing.(OR)
   b) Name the specimen collected for dermatophytoses. Is it necessary to store such specimens?
      How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male?(OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium*. (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis.(OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**

Candidate for admission to the first year of the **B.Sc., Microbiology** degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology / Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**

The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
   
   Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.
   
   The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
   
   The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
   
   The Foundation course shall comprise of two stages as follows:
   
   Foundation Course A : General Awareness (I & II semesters)
   
   Foundation Course B : Environmental Studies (III & IV semesters)
   
   The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
   
   From the printed material supplied by the University - 75%
   
   Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) **Part – III**

**Group A**: Core subject – As prescribed in the scheme of examination. 
Examination will be conducted in the core subjects at the end of every semester.

**Group B**: allied subjects -2 subjects-4 papers 
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers 
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training 
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme**: 
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education** 
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows:

- A-Exemplary
- B-very good
- C-good
- D-fair
- E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**
   a) A candidate will be permitted to appear for the university examinations for any semester if
      i) He/she secures not less than 75% of attendance in the number of working days during the semester.
      ii) He/she earns a progress certificate from the head of the institution, of having satisfactorily completed the course of study prescribed in the subjects as required by these regulations, and
      iii) His/her conduct has been satisfactory.

      Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**
   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and/or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

    a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

    b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

       (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

       (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   
i. has undergone the prescribed course of study for a period of not less than six semesters in an
   institution approved by/affiliated to the University or has been exempted from in the manner
   prescribed and has passed the examinations as have been prescribed therefor.
   
ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a
   certificate issued by the Principal of the institution.
   
iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the
   first attempt, within the minimum period prescribed for the course of study from the date of
   admission to the course and secures I or II class shall be eligible for ranking and such ranking
   will be confined to 10% of the total number of candidates qualified in that particular branch of
   study, subject to a maximum of 10 ranks.
   
The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical
   shall be permitted to do so and such candidate shall join a college in the III year of the course
   and he/she will be permitted to appear for Part III alone by granting exemption form appearing
   Part I, Part II and common allied subjects (if any), already passed by the candidate. And a
   candidate desirous to obtain an additional UG degree involving practical shall be permitted to
   do so and such candidate shall join a college in the II year of the course and he/she be permitted
   to appear for Part III alone by granting exemption form appearing for Part I, Part II and the
   common allied subjects. If any, already passed. Such candidates should obtain exemption from
   the university by paying a fee of Rs.500/-.

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective
   courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each
   paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change
   for a minimum period of three years from the date of approval of the Regulations. The
   University may revise/amend/change the Regulations and Scheme of Examinations, if found
   necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will
   be permitted to take the Examinations under those Regulations for a period of four years i.e. up
   to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the
   Examination only under the Regulations in force at that time.
### SCHEME OF EXAMINATIONS

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<th>Sem</th>
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*NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I

CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram”s, Spore, AFB_),Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour,Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER - II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount – LCB Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave , Hot air oven , Incubator , Water Bath , Laminar air flow, BOD incubator, Centrifuges – Bench top , High sped , Ultra centrifuge.

UNIT – II

pH meter , Conductivity meter, Lyophilizer , McIntosh anaerobic jar , Biosensor, Metabolic shaker.

UNIT -III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al./Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA - the genetic material, RNA - the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation – spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S., 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate- Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA- radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT-III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV

Fermented food – pickled cucumber, saurkraut, soysauce, Bread, Idli – Fermented dairy products – Yoghurt and cheese.

UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References

SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application,- Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application , Bioremediation.

References
SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT - IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References

SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I

Early development of virology – general properties of viruses- cultivation of Viruses- virus purification and assays. The structure of viruses- virion size-
General structure properties- helical capsids, icosohedral capsid- nucleic acids-
Viral envelopes and enzymes- virus classification.

UNIT- II

Reproduction of DNA phages- ds DNA lytic phages- lytic cycle of T4 phage
The one step growth- adsorption to the host cell and penetration- synthesis of Phage nucleic acids and protein assembly of phage particles- release of phage particles. Example of ss DNA phage- OX 174- circle replication.

UNIT-III

Lysogeny- temperate bacteriophages- lambda phage- induction of lysogens-

UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A,B).
Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References

SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT - I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT - II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diphtheriae.

UNIT - III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- Clostridium perfringens, Clostridium tetani.

UNIT - IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydia, Rickettsiae.

References

5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II

MEDICAL MICROBIOLOGY - II

UNIT - I
Mycology: superficial infections- *Dermatophytes* - *Microsporum* – *Trichophyton*, 
*Epidermophyton* - *Madura mycosis* - Opportunistic fungal infections - *Candida* 
*Albicans*, *Aspergillus*, *Mucor*.

UNIT - II
Parasitic diseases- *Plasmodium vivax*, *Giardia*, *Taenia solium*, *Ancylostoma*, *Ascaris*, 
*Wuchereria bancrofti*, *Enterobius*, *Trichuris trichura*.

UNIT - III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown 
Origin meningitis, diarrhea, respiratory tract infections.

UNIT - IV
Pyogenic infections- *Staphylococcus* and *Pseudomonas*: sexually transmitted 
diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin 
typing.

UNIT - V
Antibiotics and chemotherapeutic agents- Mechanism of actions – Drug 
resistance – Antimicrobial susceptibility testing- Disc diffusion- Kirby Bauer 
method.

References
Orient Longman.
Moshby Publications.
Brothers Medical Publishers (P) Ltd.
SEMESTER VI
GRA CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli*, *Klebsiella pneumoniae*, *Proteus*, *Salmonella*, *Shigella*, *Pseudomonas*, *Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans*, *Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus*, *Mucor*, *Penicillium*, *Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization - Demonstration
15. Observation of parasites – *Entamoeba*, *Plasmodium*, *Ascaris*, *Taenia*.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT –IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches – rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV  
DIPLOMA PAPER II  
DIAGNOSTIC MICROBIOLOGY – I  
(BACTERIOLOGY AND SEROLOGY)  

UNIT – I  

UNIT – II  
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II  
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III  
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV  
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V  
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References  
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol
       salt agar and XLD agar
3. Biochemical Characterization- IMViC, TSI, GLSM, Oxidase, Catalase, Urease and
   Coagulase.
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- *Entamoeba, Plasmodium, Ascaris, Taenia*
MODELED QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR
alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert Koch  b) Louis Pasteur  c) Antony Von Leewenhock  d) Both b & c
2) Immunity mediated by antibodies are called as ________________
   a) Humoral  b) Cell mediated  c) Active  c) Passive
3) ________ is the ability of a lens to separate or distinguish between small objects that are close
   together.
4) ____________ is used as a counter stain in spare staining
   a) Safranin  b) Methylene blue  c) Malachite green  d) Crystal violet
5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP  b) TDT  c) D  d) None of the above.
6) HEPA filters can remove particles of size ________________
   a) 0.2 um  b) 0.3 um  c) 0.4 um  d) 0.5 um
7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms  b) Anaerobic organisms  c) Facultative anaerobic organisms  d) Microphlic organisms
8) ________________ is an example for selective media.
   a) Mac conkey agar  b) EMB agar  c) Both a & b  d) None of the above.
9) TVC refers to ____________
   a) Total viable count  b) Total viral count  c) Total viable colony  c) None of the above.
10) ________________ is an example for short term preservation of microbes.
    a) Agar slant  b) Agar slant  c) Mineral oil overlay  d) a, b & c.

SECTION-B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germs theory of disease and to
   the treatment or prevention of diseases. (or)
   b) Describe koch's postulates in detail.
12) a) Describe fluorescence microscope (or)
   b) Describe capsule staining.
13) a) Write the principle and application of autoclave. (or)
   b) Comment on phenol coefficient test.
14) a) Comment on pure culture techniques. (or)
   b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.
15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
   b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - AnswerALLQuestions.

16) a) Describe spontaneous generation theory. (or)
    b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
    b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
    b) Describe filtration and its types.
19) a) Discus the types of media with eg. for each. (or)
    b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
    b) Describe the types of long term preservation of cultures.

CORE PAPER II -MICROBIAL DIVERSITY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group

2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram (b) Similarity matrix (c) Dendrogram (d) None of the above

3. Which of the following is a motile bacterium
   (a) Esherichia coli (b) Klebsiella (c) Bacillus subtilis (d) Staphylococcus aureus

4. All the following are true about Mycoplasma except
   (a) Lack cell wall (b) Colonies have fried egg appearance (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes

5. The photosynthetic organelles in bacteria is
   (a) Chloroplast (b) Plastid (c) Thylakoid (d) Pyrenoid

6. Bacteriorhodopsin is present in
   (a) Methanogens (b) Halophiles (c) Thermophiles (d) Purple sulphur bacteria

7. The sexual spores formed by Agaricus is called
   (a) Ascospores (b) Zygospores (c) Basidiospores (d) Sporangiospores

8. All the following are asexual spores of fungi except
   (a) Sporangiospores (b) Zygospores (c) Conidiospores (d) Chlamydospores

9. The members of phaeophyta are commonly known as
   (a) Red algae (b) Green algae (c) Blue green algae (d) Brown algae

10. All the following are true about protozoa except
    (a) All members have cell wall (b) Move by flagella/pseudopodia
    (c) Unicellular (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) What is serotaxonomy? explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.

12. (a) Give distinguishing characters of clostridium. Or
   (b) State the important features and significance of enterobacteria.

13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples

14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium

15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - AnswerALLQuestions.

16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
   (b) List out and describe the genetic characters used in taxonomy.

17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of Bergeys manual and its importance.

18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples.

19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.

20. (a) Describe the general characters and the importance of Chlorophyta and phaeophyta. Or
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds

2. Polarly flagellated bacteria is known as _____________
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane  (b) Mitochondria
   (c) Polyphosphate granules  (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes  (b) A double membrane structure
   (c) Communication with cytoplasm  (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  (c) M13 Phage  (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport  (b) Facilitated diffusion  (c) Symport  (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells  (b) Prokaryotic cells  (c) Both a & b  (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles  (b) Extreme thermophiles  (c) Acidophiles  (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage  (b) Ether linkage  (c) B 1-4 linkage  (d) Ionic linkage

**SECTION – B (5X6=30Marks) - Answer ALL Questions.**

11. (a) Describe the capsule and slime layer of prokaryotic cell.  Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum.  Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis.  Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion.  Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria.  Or
    (b) What are methanogens? Exemplify the role with examples.

**SECTION – C (5X12=60Marks)
Answer ALL Questions.**

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization.  Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplasts.  Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell.  Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles.  Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                                                                 Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water                  (b) Pigments              (c) Light            (d)H2S
2. *Thiobacillus thiooxidans* is an example of----------
   (a)Chemoautotrophs         (b)Heterotrophs         (c)Photoautotrophs    (d)Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant          (b) Barotolerant         (c) Psychrophilic      (d)Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture   (b)Batch culture        (c) Continous culture  (d)Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid           (b) Fumaric acid       (c) Lactic acid        (d) ketoglutaric acid
6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP                 (b) ED                  (c) HMP                (d)TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound     (b)Oxygen              (c) Nitrogenous compound (d) Carbondioxide
8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae* (b)*Chlorella sp*  (c) *Klebsiella sp*  (d) *Escherichia coli*
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water               (b) Sunlight           (c)H2S                (d) O2
10. The carrier molecule in cell- wall biosynthesis is a----
    (a) Lipid               (b) Carbohydrate      (c)Protein            (d) None of the above

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria.   Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth.  Or
    (b) Give an account on Diauxic growth.
13. (a) Giving suitable example, describe substrate level phosphorylation.  Or
    (b) Describe ED pathway.
14. (a) describe alcoholic fermentation.  Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a) What is anoxygenic photosynthesis? Describe.  Or
    (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria.  Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth.  Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or 
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or 
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or 
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization  b. incineration  c. autoclave  d. oven.
3. Lyophilization is the
   a. separation of proteins  b. sudden freezing and dehydration  c. enzyme reaction by oxidation  d. high pressure–segmentation.
4. The pH is defined as
   a. logH⁺  b. log2H⁺  c. -logH⁺  d. -log2H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solution  b. nucleic acid  c. proteins  d. enzymes.
8. NPK analysis is done using
   a. electrophoresi  b. centrifugation.  c. flame photo  d. chromatography.
9. The pH of the blood is
   a. 6.3  b. 7.4  c. 7.0  d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION B (5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
     .b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
     .b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
     .b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry.   (or)
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge.  (or)
b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications.  (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter?  (or)
b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology.
   with their applications  (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV  b) Retrovirus  c) Pox  d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A  b) B  c) C  d) Z

3) Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase  b) helicase  c)polymerase  d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg  c) Meselson &stahl  d) Hershey & Chase

5) no of codons constitute the coding dictionary
   a) 64  b) 61  c) 62  d) 60
6) CAP is involved in--------?  
   a) Catabolic repression    b) Induction c) Feed back inhibition       d) None of these
7) ---------is an example for intercalating agent?  
   a) Acridine orange   b) EMS   c) Nitrous oxide     d) UV
8) Lex protein are involved in ----type of repair?  
   a) SOS   b) Photoreactivation  c) Exision repair d) All of the above
9) Davis-u-tube expt is used to prove the existence of--------?  
   a) Transformation  b) Conjugation    c) Transduction  d) Recombination
10) Transformation was proved and demonstrated by-----  
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B (5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA OR  
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment OR  
    b) Describe DNA polymerase
13) a) Explain the features of genetic code OR  
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test OR  
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction OR  
    b) Describe holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material OR  
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell? OR  
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli OR  
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage? OR  
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene OR  
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII -PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs 

Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) __________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) __________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as __________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator  c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as __________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as __________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as __________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Giva a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY
Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8C, 30 min (b) 62.5C, 30 min (c) 71.7C, 15 sec (d) 71.7C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus (b) Bacillus (c) Saccharomyces (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather (b) springer (c) flipper (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce (b) yoghurt (c) bread (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides (b) Streptococcus faecalis (c) Pediococcus cerevisiae (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample (b) storage of sample at room temperature for 24 hr (c) gathering information (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

SECTION B (5X6=30Marks) - Answer ALL Questions.
11a) What is the significance of molds in food microbiology? Describe. (or)
b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)

b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.

16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)

b) What are the various factors that influence the growth of microorganisms in foods.

17a) Discuss the use of high temperature in food preservation (or)

b) Discuss the principles of food preservation.

18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)

b) Discuss the biological spoilage of canned foods.

19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)

b) With neat flow chart describe the production of cheese.

20a) Describe in detail about food borne infections caused by bacteria. (or)

b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs
Maximum – 75 Marks

RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. GAATTC is the recognition sequence of
   (a) BamHI    (b) EcoRI    (c) HindIII    (d) HaeIII

2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase    (b) E.coli ligase    (c) Sal ligase    (d) All

3. Phosphoramidite method is used for the synthesis of
   (a) DNA    (b) Protein    (c) Phosphatase    (d) Phosphoric acid

4. Plasmids are DNA strands which are
   (a) Extrachromosomal    (b) Double stranded    (c) Self replicating    (d) All the above

5. Insertional vectors are derived from
   (a) Bacterial plasmid    (b) Phage lambda    (c)M13 Phage    (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of
   (a) Phage    (b) Plasmid    (c) Plasmid and phage    (d) Fungi.

7. Colony hybridization technique is employed for
   (a)Selection of vector    (b)Unhybridised ones    (c)Selection of desirable clones    (d)None of the above

8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation    (b) Microinjection    (c) Transformation    (d) None

9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus    (b) Thermus aquaticus    (c) Thermobacter aquaticus(d) Thermus aquatica

10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot    (b) Northern blot    (c) Western blot    (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or
(b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or
(b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or
(b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or
(b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or
(b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or
(b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or
(b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
(b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
(b) How will you identify the presence of r DNA in a cell?.
20. (a) Explain Southern blotting technique and its applications. Or
(b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs
aximum – 75 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) ------------ are broad spectrum antiviral products
   a) Histones  b) IFN  c) Streptomycin  d) Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c) Xanthococcus  d) Zymomonas
3) ------------ is involved in the fusion of myloma cells with spleen cells
   a) PEG  b) PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as ------------
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) ---------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is ------------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c) Dinosaurs  d) Mice
8) ------------ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c

9) ------------ marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3

10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION –B (5X5=25Marks) - Answer ALL Questions.

11a) Write a brief account on commercial biosynthesis of interferons (or)
    d) List the uses Human growth hormone and brief on its commercial production

12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies

13a) Explain in short the application and development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain

14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin

15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION –C (5X8=40Marks) - Answer ALL Questions.

16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers

17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy

18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants

19a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application (or)
    b) Discuss about transgenic- goat, pig, birds and fish

20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1.  Erlenmeyer flasks are used in fermentation process during
    a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation

2.  Glutamic acid is used for
    a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation

3.  Steady state is achieved in ____________ fermentation.
    a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a________________
   a. open culture system   b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system

5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product

6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag       b. log       c. stationary   d. decline

7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore   b. Massachusetts Institute of technology
   c. MTCC   d. Imperial chemical Industries.

8. __________ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal

9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control   c. sterilization   d. packaging

10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid   c. both   d. none

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11.a. Discuss the significance of microbes in the production of commercially important products.
( or)   b. Write a short note on the isolation of alkaline protease producers from soil.

12.a. Explain briefly batch culture  (or)
     b. Differentiate submerged and solid state fermentation.

13.a. Describe in detail fungal protease production.  (or)
     b. Discuss the methods of immobilization and add a note on its significance.

14.a. Describe the role of yeast in bread making  (or)
     b. Write about single cell protein.

15.a. Discuss the methods distruption of cells by physical methods.  (or)
     b. Write short notes on batch filters that are employed in down streaming processing.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Give a detailed account on the various methods of strain improvement  (or)
     b. Discuss the methods for screening of industrially important microorganism.

17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.  (or)
     b. Give a detailed account on solid state fermentation with its applications.

18.a. Elaborate on the various steps involved in beer production.  (or)
     b. Write an essay on the commercial production in beer production.

19.a. Explain briefly the industrial application of yeast.  (or)
     b. Describe in detail the development of Oyster mushroom.

20.a. Describe in detail the recovery and purification of intracellular products with examples.  (or)
     b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism b) Commensalism c) Parasitism d) Synergism
2) Mycorhizal association is an example of
   a) Ammensalism b) Commensalism c) Parasitism d) Symbiosis
3) ---------------- is an example of recalcitrant compound
   a) Lignin b) Protein c) Carbohydrate d) Lipid
4) Fermentation is an example for ---------- degradation
   a) Aerobic b) Anaerobic c) a and b d) None of the above
5) ---------------- is a cellulolytic bacteria
   a) Pseudomonas b) Klebsiella c) Mycoplasma d) Zymomonas
6) Rhizobium exist as -------- in the nodules
   a) Protoplast b) Bacterioides c) Mycoplasma d) None of the above
7) Azospirillum is an example for
   a) Free living b) Symbiotic c) associative d) all the above
8) According to the American standard of potability ---------- number of E.coli can present in 100 ml of water
   a) 1 b) 0 c) 10 d) 100
9) Application of alum is in ------- phase of water treatment
10) Super Bug was developed and patented by ---------
   a) Khorana b) Kohnberg c) Chakraborthy d) Sanger

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil
12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin
13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle
14a) Discuss MPN technique (or)
    b) Explain Eutrophication
15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil
17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes
18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle
19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology
20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?  
(a) Bejerinck  
(b) D. Ivanowski  
(c) W. Stanley  
(d) M. Theiler

2. The spikes are otherwise  
(a) Peplomers  
(b) Capsid  
(c) Envelope  
(d) Coat

3. The one step growth experiment was developed by  
(a) Bejerinck  
(b) D. Ivanowski  
(c) W. Stanley  
(d) Max Delbruck and Emory Ellis

4. Single stranded DNA phage is  
(a) T4 phage  
(b) MS2  
(c) QB  
(d) OX 174

5. The process of release of the prophage from the bacterial DNA is called  
(a) Conduction  
(b) Transfection  
(c) Insertion  
(d) Induction

6. The int gene codes for the synthesis of an enzyme  
(a) Integrase  
(b) Ligase  
(c) Excisionase  
(d) Replicase

7. TMV has a Linked transport of two substances in the same direction is called  
(a) Non – infectious ss RNA  
(b) Infectious ss RNA  
(c) Non – infectious ss DNA  
(d) Infectious ss DNA

8. Plant viruses penetrate the host cells through  
(a) Endodesmata  
(b) Pore  
(c) Echodesmata  
(d) None of the above

9. In Herpes viridae the viral envelope adsorbs to the receptors on  
(a) Plasma membrane  
(b) Cytoplasm  
(c) Nucleus  
(d) None of the above

10. For measles, the immunogen is  
(a) Active but attenuated  
(b) Inactive but attenuated  
(c) Inactive heat killed  
(d) Inactivated

SECTION – B (5X6 = 30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or  
(b) Write a note on viral envelopes and enzymes.

12. (a) Explain the one step growth experiment. Or  
(b) Give an account on the structure of a typical bacterial virus.

13. (a) Give an account on reproduction of RNA phage. Or  
(b) Describe lysogenic conversion and its significance.

14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or  
(b) Write a note on characteristics of the viruses that infect algae and fungi.

15. (a) Write short notes on AIDS. Or  
(b) Give a brief outline on Rubella virus.

SECTION – C (5X12 = 60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or  
(b) Give a brief account on the early development of virology.

17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or  
(b) Give a detailed account on ss DNA phage.

18. (a) Describe the temperate bacteriophages and lysogeny. Or  
(b) Give a brief account on generation of defective phages and their uses.

19. (a) Explain briefly the reproduction of plant viruses. Or  
(b) Give a detailed account on viruses and cancer.

20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or  
(b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs

Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given:

1. An example of zoonotic disease a. Malaria b. filariasis c. plaque d. all the above
2. Persons with symptomless infection is called a. immuned b. carrier c. vector d. resistant
3. The commonest cause of localized suppurative lesion in man is a. streptococci b. staphylococci c. Pseudomonas d. Vibrio
5. Spot the Gram positive anaerobic endospore forming bacillus a. Lactobacillus b. Corynebacterium c. Clostridium d. Mycobacterium
6. Clostridium tetani is the causative agent of a. anthrax disease b. lock jaw c. hepatitis d. rabies
7. Food borne intoxication is caused by a. Salmonella b. E.coli c. Shigell d. Staphylococcus
8. Darter motility is seen with a. E.coli b. Streptococcus c. V.cholerae d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae a. SS agar b. BSA c. LJ d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is a. faeces b. urine c. sputum d. blood

SECTION–B(5x5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers. (or)
   b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)
   b. Give the features of B.anthracis
13.a. Describe the methods for diagnosis to tetanus (or)
   b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)
   b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidiae. (or)
   b. Give the features of Rickettsiae.

SECTION–C(5x8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples. (or)
   b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
   b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
   b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
   b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
   b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs  Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha  b) Mycelium  c) Mould  d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci  b) P. notatum  c) Rhizopus  d) Mucor

3. Candidosis is caused mainly by ____________
   a) C. albicans  b) C. tropicalis  c) C. pseudotropicalis  d) C. krusei

4. The major organism which causes urinary tract infection is _______________
   a) E. coli  b) Salmonella  c) Shigella  d) Klebsiella

5. Traveller's diarrhea is caused by _______________
   a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli  d) Enterotoxigenic E.coli

6. Blue pus is caused by ________ a) Pseudomonas b) Vibrio  c) Salmonella  d) E. Coli

7. Sexually transmitted disease is caused by ______________
   a) Treponema  b) Klebsiella  c) Proteus  d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as ____________
   a) Septicemia  b) bacteremia  c) Viremia  d) Algemia

9. MIC denotes ______________
   a) Maximum inhibitory concentration  b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration  d) None of the above

10. Endoflagella is a characteristic nature present in ____________
    a) Spriochetes  b) Salmonella  c) Proteus  d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium  (or)  b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or)  b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17. a) Describe Trichus trichura  (or)
    b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis (or)  b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER  I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs

Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients’ blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of *Mycobacterium tuberculosis*, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
   b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
   b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
   b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
   b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
   b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine  b) Mid stream urine  c) Urine form catheter bag  d) Early morning urine sample

2. All the following are acid fast except,
   a) *Mycobacterium*  b) *Actinomycetes*  c) *Nocardia*  d) *Staphylococci*

3. The common medium used for growing *M tuberculosis* is
   a) Blood agar  b) Mac conkey agar  c) Lowenstein Jensen’s medium  d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Klebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*

5. Selective medium for *Staphylococci* is
   a) EMB agar  b) BSA  c) MSA  d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm

7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies  d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None

10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)

   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)

   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)

   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)

   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)

   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)

   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)

   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity.(OR)

   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)

   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe?

   Where can one obtain such information? In this information available for all pathogens. (OR)

   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Growth medium for fungus inhibits growth of
   a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica  b) Entamoeba coil  c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs  b) Larvae penetrating through the skin
   c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces.(OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics.(OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly.(OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture.(OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dermatophytoses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections. — Comment

18. a) Laboratory identification of blood protozoan — *Piasmodium*. (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY with Semester System (with effect from 2007-2008)

1. Eligibility for Admission to the Course
   Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. Duration of the Course
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. Course of Study
   The course of study for the UG degree courses of all branches shall consist of the following

   a) Part - I
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) Part – II : English
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) Foundation Course
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A:** Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

**Group B:** allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C:** application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D:** field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary  
B-very good  
C-good  
D-fair  
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

a) A candidate will be permitted to appear for the university examinations for any semester if
   
i) He/she secures not less than 75% of attendance in the number of working days during the semester.
   
   ii) He/she earns a progress certificate from the head of the institution, of having satisfactorily completed the course of study prescribed in the subjects as required by these regulations, and
   
   iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**
   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**
   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**
   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical ) in the University examination shall be declared to have passed the examination in the subject (theory or Practical ).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**
   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**
   a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

   b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

   (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

   (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he/she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from the manner prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
<table>
<thead>
<tr>
<th>Sem</th>
<th>Part</th>
<th>Subject and Paper</th>
<th>Instruction Hrs per week</th>
<th>University Examinations</th>
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<td>Core Paper VII - Principles of Immunology</td>
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<td>Core Paper VIII - Food Microbiology</td>
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<td>Diploma in Diagnostic Microbiology – Diagnostic Microbiology II (Virology and Mycology, Parasitology)</td>
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| VI  | III  | Gr A Core Paper IX - Fermentation Technology                                      | 4                        | 3                       | 100       |
|     |      | Core Paper X - Environmental and Agricultural Microbiology                         | 4                        | 3                       | 100       |
|     |      | Core Paper XI - Virology                                                           | 4                        | 3                       | 100       |
|     |      | Core Practical III                                                                | 6                        | 9                       | 150+50*   |
|     |      | Gr C Appl Oriented Subject II Medical Microbiology - I                             | 3                        | 3                       | 75        |
|     |      | Gr C Appl Oriented Subject II Medical Microbiology – II                            | 3                        | 3                       | 75        |
|     |      | Diploma in Diagnostic Microbiology – Practical I                                  | 3                        | 3                       | 50        |
|     |      | Diploma in Diagnostic Microbiology – Practical II                                 | 3                        | 3                       | 50        |
|     |      | Diploma in Diagnostic Microbiology                                                 | 3                        | 3                       | 50        |

| Total |                                | B.Sc., Microbiology            | 3200                    | Diploma in Diagnostic Microbiology | 400       |

* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) - General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiholes.

References
SEMESTER II
GRA CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry
17. Observation of representative forms of (algae) –Diatoms-Chlamydomonas-Volvox-
Cyanobacteria-Oscillatoria-Nostoc-Anabaena-(Fungi)-Aspergillus-Pencillium-Rhizopus-
Yeast-(Protozoa)-Amoeba-Plasmodium.

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT - III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave , Hot air oven , Incubator , Water Bath , Laminar air flow, BOD incubator, Centrifuges – Bench top , High sped , Ultra centrifuge.

UNIT – II

pH meter , Conductivity meter, Lyophilizer , McIntosh anaerobic jar , Biosensor, Metabolic shaker.

UNIT -III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER - V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radioimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV

Fermented food – pickled cucumber, saurkraut- soy sauce, Bread, Idli – Fermented dairy products – Yoghurt and cheese.

UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References

SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method , Chemical- Calcium chloride and DEAE Methods , Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR , Blotting (Southern, Western, Northen) Techniques, RFLP and Application , - RAPD and Application,- Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References

SEMESTER -VI  
CORE PAPER XI - VIROLOGY

UNIT -I

Early development of virology – general properties of viruses- cultivation of 
Viruses- virus purification and assays. The structure of viruses- virion size-
General structure properties- helical capsids, icosohedral capsid- nucleic acids-
Viral envelopes and enzymes- virus classification.

UNIT- II

Reproduction of DNA phages- ds DNA lytic phages- lytic cycle of T4 phage
The one step growth- adsorption to the host cell and penetration- synthesis of
Phage nucleic acids and protein assembly of phage particles- release of phage
particles. Example of ss DNA phage- OX 174- circle replication.

UNIT-III

Lysogeny- temperate bacteriophages- lambda phage- induction of lysogens-

UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of
Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A,B).
Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References

edition, Wiley and sons.

SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of
epemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis,
Corynebacterium diptheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive
Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative
organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella,
Pseudomonas, Vibrio cholerae.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium
Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira,
Chlamydas, Rickettsiae.

References
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT- I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References


SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli*, *Klebsiella pneumoniae*, *Proteus*, *Salmonella*, *Shigella*, *Pseudomonas*, *Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans*, *Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus*, *Mucor*, *Penicillium*, *Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba*, *Plasmodium*, *Ascaris*, *Taenia*.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT –IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

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Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Aplications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References

SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL – I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL – II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs
Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert Koch    b) Louis Pasteur    c) Antony Von Leewenhock    d) Both b & c

2) Immunity mediated by antibodies are called as ________________
   a) Humoral    b) Cell mediated    c) Active    c) Passive

3) _______ is the ability of a lens to separate or distinguish between small objects that are close together.

4) ___________ is used as a counter stain in spare staining
   a) Safranin    b) Methylene blue    c) Malachite green    d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP    b) TDT    c) D    d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um    b) 0.3 um    c) 0.4 um    d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms    b) Anaerobic organisms    c) Facultative anaerobic organisms    d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar    b) EMB agar    c) Both a & b    d) None of the above.

9) TVC refers to ___________
   a) Total viable count    b) Total viral count    c) Total viable colony    c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant    b) Agar slant    c) Mineral oil overlay    d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease.
17) a) Write the principle and application of bright field microscope. (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram (b) Similarity matrix (c) Dendrogram (d) None of the above
3. Which of the following is a motile bacterium
   (a) Escherichia coli (b) Klebsiella (c) Bacillus subtilis (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall  (b) Colonies have fried egg appearance  (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast (b) Plastid (c) Thylakoid (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens (b) Halophiles (c) Thermophiles (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores (b) Zygospores (c) Basidiospores (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores (b) Zygospores (c) Conidiospores (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae (b) Green algae (c) Blue green algae (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall (b) Move by flagella/pseudopodia
    (c) Unicellular (d) Some are pathogens
SECTION-B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples
14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta

SECTION-C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of Bergeys manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan   (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds   (d) other compounds
2. Polarity flagellated bacteria is known as ---------
   (a) Lophotrichous   (b) Peritrichous
   (c) Atrichous   (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast.. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                                      Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use -------- as source of energy
   (a) Water           (b) Pigments (c) Light           (d)H2S
2. *Thiobacillus thiooxidans* is an example of--------
   (a)Chemoautotrophs (b)Heterotrophs (c)Photoautotrophs (d)Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant    (b) Barotolerant (c) Psychrophilic (d)Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture (b)Batch culture (c) Continous culture (d)Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid     (b) Fumaric acid (c) Lactic acid (d) ketoglutaric acid
6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP           (b) ED     (c) HMP       (d)TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound (b)Oxygen (c) Nitrogenous compound (d) Carbon dioxide
8. Which of the following carries out mixed acid fermentation?
   (a) Saccharomyces cerevisiae (b)Chlorella sp   (c) Klebsiella sp   (d) Escherichia coli
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water           (b) Sunlight   (c)H2S          (d) O2
10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid           (b) Carbohydrate (c)Protein       (d) None of the above

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.
13. (a) Giving suitable example, describe substrate level phosphorylation. Or
    (b) Describe ED pathway.
14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a) What is anoxygenic photosynthesis? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria. Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or 
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or 
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or 
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of 
   a. dry air sterilization    b. moist air sterilization    c. membrane filtr d. chemical sterilization.
2. Moist heat sterilization is achieved by 
   a. lyophilization   b. incineration   c. autoclave   d. oven.
3. Lyophilization is the 
   a. separation of proteins   b. sudden freezing and dehydration   c. enzyme reaction by oxidation   d. high pressure–segmentation.
4. The pH is defined as 
   a. logHb  b. log2Hc  c. -logHd  d. -log2He
5. Which is used as an absorbent in TLC. 
   a. KCl solution   b. lead sulphate   c. anions   d. silica gel
6. SDS-PAGE is used to separate 
   a. nucleic acid   b. lipid   c. protein   d. carbohydrate.
7. UV light is significantly absorbed by 
   a. coloured solution   b. nucleic acid   c. proteins   d. enzymes.
8. NPK analysis is done using 
   a. electrophoresis   b. centrifugation.   c. flame photo   d. chromatography.
9. The pH of the blood is 
   a. 6.3   b. 7.4   c. 7.0   d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION B(5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or) 
   .b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or) 
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or) 
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology. with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV       b) Retrovirus c) Pox       d) Bacteriophage
2) Which form of DNA is prevalent in living cells?
   a) A       b) B       c) C       d) Z
3) -----------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase    b) helicase   c)polymerase     d) primase
4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad b) Tautam &Lederberg c) Meselson &stahl d) Hershey & Chase
5) ----------- no of codons constitute the coding dictionary
   a) 64       b) 61       c) 62       d) 60
6) CAP is involved in----------?
   a) Catabolic repression   b) Induction c) feed back inhibition     d) None of these
7) ----------is an example for intercalating agent?
   a) Acridine orange   b) EMS   c) Nitrous oxide d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS b) photoreactivation c) Exision repair d) all of the above
9) Davis-u-tube expt is used to prove the existance of--------?
   a) Transformation b) conjugation   c) transduction d0 recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger   c) Grick d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA OR b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment OR b) Describe DNA polymerase
13) a) Explain the features of genetic code OR b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test OR b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction OR b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material OR b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell? OR c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli OR b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage? OR b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene OR b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) _____________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ____________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ________________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator  c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as __________________
    a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ______
    a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as
    a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as __________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

**CORE PAPER VIII - FOOD MICROBIOLOGY**

**Duration – 3hrs**

Maximum – 100 Marks

**SECTION A (10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti    (b) pyruvic acid    (c) fumaric acid    (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia    (b) Flavobacterium    (c) Micrococcus    (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min    (b) 62.5°C, 30 min    (c) 71.7°C, 15 sec    (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus    (b) Bacillus    (c) Saccharomyces    (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer    (b) sauerkraut    (c) soft drinks    (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather    (b) springer    (c) flipper    (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce    (b) yoghurt    (c) bread    (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides    (b) Streptococcus faecalis
   (c) Pediococcus cerevisiae    (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample    (b) storage of sample at room temperature for 24 hr
   (c) gathering information    (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin    (b) a neurotoxin    (c) a hepatotoxin    (d) a nephrotoxin.

**SECTION – B (5X6=30Marks) - Answer ALL Questions.**

11a) What is the significance of molds in food microbiology? Describe. (or)
   b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
   b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
   b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
   b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.
19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI     (b) EcoRI    (c) HindIII (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase (b) E.coli ligase (c) Sal ligase (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA      (b) Protein   (c) Phosphatase (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosal (b) Double stranded     (c) Self replicating (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda   (c)M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage      (b) Plasmid     (c) Plasmid and phage (d) Fungi.
7. Colony hybridization technique is employed for
   (a)Selection of vector (b)Unhybridised ones (c)Selection of desirable clones (d)None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation  (b) Microinjection
   (c) Transformation  (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus (b) Thermus aquaticus
   (c) Thermobacter aquaticus(d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot     (b) Northern blot   (c) Western blot     (d) Eastern blot
SECTION – B (5X5=25 Marks) - Answer ALL Questions.

11. (a) Define cloning. Explain the various steps involved in cloning.  
(b) Explain the action of Methylases.

12. (a) Write a note on YAC.  
(b) Explain a typical cosmid vector.

13. (a) Give an account on cDNA synthesis.  
(b) How will you purify plasmid DNA?

14. (a) How alpha complementation of lac Z helps one to identify clone?  
(b) How will you identify a recombinant DNA by immunological assay?

15. (a) Explain Northern blotting technique.  
(b) Give an account on RAPD.

SECTION – C (5X8=40 Marks) - Answer ALL Questions.

16. (a) Define restriction enzyme and add a note on classification and its uses.  
(b) Give a brief account on ligases.

17. (a) Explain the construction of cDNA and DNA library.  
(b) Explain the chemical synthesis of DNA in laboratory.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  
(b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Give a detailed account on gene transfer techniques.  
(b) How will you identify the presence of r DNA in a cell?

20. (a) Explain Southern blotting technique and its applications.  
(b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs  
aximum – 75 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) ---------- are broad spectrum antiviral products  
   a) Histones  b) IFN  c) Streptomycin  d) Nystatin

2) Xanthan gum is produced from  
   a) Pseudomonas putida  b) Xanthomonas campestris  c) Xanthococcus  d) Zymomonas

3) ---------- is involved in the fusion of myeloma cells with spleen cells  
   a) PEG  b) PGA  c) IPTG  d) EtBr

4) Vaccines that require a carrier molecule for its activity is called as ----------  
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide

5) ---------- required for the transfer of the T DNA from A. tumifaciens to plant cells  
   a) vir genes  b) Right border  c) Left border  d) IAA

6) Nopaline is ----------  
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme

7) Example of an animal model involved in transgenesis  
   a) Monkey  b) Snake  c) Dinosaurs  d) Mice
8) Method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) Marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION – B (5X5=25Marks) - Answer ALL Questions.

11a) Write a brief account on commercial biosynthesis of interferons (or)
    d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application ad development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.

16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in ____________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a _______________
   a. open culture system     b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system
5. Streptomycin fermentation by S. griseus produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at _______ stage of their growth.
   a. lag     b. log     c. stationary     d. decline
7. The term single –cell protein was coined at__________ in 1966
   a. CFTRI, Mysore       b. Massachusetts Institute of technology
   c. MTCC       d. Imperial chemical Industries.
8. ____________ was at one time the most important substrate for SCP production
   a. methanol     b. methane     c. oil     d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control   c. sterilization   d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid   c. both   d. none

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. Discuss the significance of microbes in the production of commercially important products.
    (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture  (or)
       b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.  (or)
       b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making  (or)
       b. Write about single cell protein.
15.a. Discuss the methods disruption of cells by physical methods.  (or)
       b. Write short notes on batch filters that are employed in down streaming processing.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Give a detailed account on the various methods of strain improvement  (or)
       b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.  (or)
       b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.  (or)
       b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.  (or)
       b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.  (or)
       b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) ----------------- is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an example for ---------------- degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) ----------------- is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as ---------------- in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability ----------------- number of E. coli can present in 100 ml of water
   a) 1  b) 0  c) 10  d) 100

9) Application of alum is in --------- phase of water treatment

10) Super Bug was developed and patented by ---------
     a) Khorana  b) Kohnberg  c) Chakraborty  d) Sanger

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
     b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
     b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
     b) Explain carbon cycle

14a) Discuss MPN technique (or)
     b) Explain Eutrophication

15a) Describe Air pollution (or)
     b) Explain the methodology involved in Microbiological Air quality

SECTION – C(5X12=60Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
     b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
     b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
     b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
     b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
     b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?
   (a) Bejerinck    (b) D. Ivanowski    (c) W. Stanley    (d) M. Theiler
2. The spikes are otherwise
   (a) Peplomers    (b) Capsid    (c) Envelope    (d) Coat
3. The one step growth experiment was developed by
   (a) Bejerinck    (b) D. Ivanowski    (c) W. Stanley    (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is
   (a) T4 phage    (b) MS2    (c) QB    (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called
   (a) Conduction    (b) Transfection    (c) Insertion    (d) Induction
6. The int gene codes for the synthesis of an enzyme
   (a) Integrase    (b) Ligase    (c) Excisionase    (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called
   (a) Non – infectious ss RNA    (b) Infectious ss RNA    (c) Non – infectious ss DNA    (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through
   (a) Endodesmata    (b) Pore    (c) Echodesmata    (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on
   (a) Plasma membrane    (b) Cytoplasm    (c) Nucleus    (d) None of the above
10. For measles, the immunogen is
    (a) Active but attenuated    (b) Inactive but attenuated    (c) Inactive heat killed    (d) Inactivated

SECTION B (5X6=30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region.
    Or
    (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment.
    Or
    (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage.
    Or
    (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell.
    Or
    (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS.
    Or
    (b) Give a brief outline on Rubella virus.

SECTION C (5X12=60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods.
    Or
    (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage.
    Or
    (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny.
    Or
    (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses.
    Or
    (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus.
    Or
    (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs

Maximum – 75 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease
   a. Malaria  b. filariasis  c. plague  d. all the above
2. Persons with symptomless infection is called
   a. immuned  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
4. Toxigenecity of C. diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with a. E. coli  b. Streptococcus  c. V. cholerae  d. S. typhi
9. Which one of the following media is used for the cultivation of M. leprae
   a. SS agar  b. BSA  c. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces  b. urine  c. sputum  d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. a. Define and differentiate carriers. (or)
    b. State Koch postulates.
12. a. Give the features of Streptococcus. (or)
    b. Give the features of B. anthracis
13. a. Describe the methods for diagnosis to tetanus (or)
    b. Describe the methods for diagnosis of gas gangrene.
14. a. Write a short note on enteric fever. (or)
    b. Write a short note on bacillary dysentery.
15. a. Give the features of Chlamidia. (or)
    b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. a. Elucidate the methods of transmission of infection with examples. (or)
    b. As a microbiologist how would you take up an investigation of epidemics? Add a note
       on control measures you would adopt with a suitable case study.
17. a. Give a detail account on diphtheria with a clear profile on the causative organism. How
       would you diagnose the same? (or)
    b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18. a. Describe the morphology, pathogenicity and laboratory diagnosis of C. tetani. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of C. perfringens.
19. a. Describe the morphology, pathogenicity and laboratory diagnosis of E. coli. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of V. cholerae.
20. a. Comment on the pathogenicity and laboratory diagnosis of T. pallidum. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha   b) Mycelium   c) Mould   d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci   b) P. notatum   c) Rhizopus   d) Mucor

3. Candidosis is caused mainly by _____________.
   a) C. albicans   b) C. tropicalis   c) C. pseudotropicalis   d) C. krusei

4. The major organism which causes urinary tract infection is ________________
   a) E. coli   b) Salmonella   c) Shigella   d) Klebsiella

5. Traveller's diarrhea is caused by ________________.
   a) Enteropathogenic E. coli   b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli   d) Enterotoxigenic E.coli

6. Blue pus is caused by ______ a) Pseudomonas b) Vibrio c) Salmonella d) E. Coli

7. Sexually transmitted disease is caused by ________________.
   a) Treponema   b) Klebsiella   c) Proteus   d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as ________________
   a) Septicemia   b) bacteremia   c) Viremia   d) Algemia

9. MIC denotes ________________
   a) Maximum inhibitory concentration   b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration   d) None of the above

10. Endoflagella is a characteristic nature present in ________________
    a) Spriochetes   b) Salmonella   c) Proteus   d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium   (or)   b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14.a) Describe briefly on pyogenic infections.   (or)   b) Comment on Pseudomonas.

15.a) Explain the mechanism of drug resistance   (or)
     b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16.a) Add a note on opportunistic fungal infections   (or)
    b) Aspergillosis Describe.

17.a) Describe *Trichusis trichura*   (or)
     b) Comment on *Wucheraria bancrofti*

18.a) Describe the etiology and lab diagnosis of diarrhegenic *E.Coli* (or)
     b) Comment on pyogenic infections caused by *Staphylococcus*

19.a) Comment on meningitis   (or)   b) Describe pyrexia

20.a) Describe drug resistance nature of bacteria
     b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuart's medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recap, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of *Mycobacterium tuberculosis*, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections? (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions.(OR)
b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory.(OR)
b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of Mycobacterium tuberculosis.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens?(OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine.  b) Mid stream urine  c) Urine form catheter bag  d) Early morning urine sample
2. All the following are acid fast except,
   a) Mycobacterium  b) Actinomycetes  c) Nocardia  d) Staphylococci
3. The common medium used for growing M tuberculosis is
   a) Blood agar  b) Mac conkey agar  c) Lowenstein Jensen’s medium  d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) E. coli  b) Kiebsiella pneumoniae  c) Proteus vulgaris  d) Pseudomonas aeruginosa
5. Selective medium for Staphylococci is
   a) EMB agar  b) BSA  c) MSA  d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm
7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies  d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None
10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.
11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.
12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.
13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.
14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.
15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.
17. a) How can a clinical microbiologist determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.
18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.
19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.
20. a) What information is essential for the design of a pathogen specific nucleotide probe? Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY
Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria   b) Protozoa   c) Virus   d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus   b) Candida   c) Saccharomyces   d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon   b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic   d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium   b) Taenia saginata   c) Taenia corporis   d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica   b) Entamoeba coil   c) Entamoeba hartmanni   d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs b) Larvae penetrating through the skin
   b) c) Ingestion of larvae   d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar   b) Cell culture   c) Corn meal agar   d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA   b) IHA   c) Immunoelectrophoresis   d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg   b) HBsAg + HBcAg   c) HBsAg + Core antibody   d) HBcAg
10. Viruses are
    a) Found primarily in soil   b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar   d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing
    another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this
    action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to
    relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dermatophytoses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *P. falciparum.* (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and
COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY
with Semester System
(with effect from 2007-2008)

1. Eligibility for Admission to the Course
   Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. Duration of the Course
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. Course of Study
   The course of study for the UG degree courses of all branches shall consist of the following

   a) Part - I
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) Part – II : English
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) Foundation Course
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A**: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application –oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme**: 
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary  
B-very good  
C-good  
D-fair  
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**
   a) A candidate will be permitted to appear for the university examinations for any semester if
      i) He/she secures not less than 75% of attendance in the number of working days during the semester.
      
      ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and iii) His/her conduct has been satisfactory.

      Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**
   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.”
6. **Medium of Instruction and examinations**
   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**
   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**
   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**
   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**
    a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

    b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

       (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

       (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10 % of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for part III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
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* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, Mcintosh fieldes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – McIntosh fildes jar
16. Micrometry
17. Observation of representative forms of (algae) –Diatoms-Chlamydomonas-Volvox-
Cyanobacteria-Oscillatoria-Nostoc-Aspergillus-Pencillium-Rhizopus-
Yeast-(Protozoa)-Amoeba-Plasmodium.

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High speed, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT -III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al./Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER - V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment - mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S., 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER – V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT - III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT - IV


UNIT - V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V  
APPLICATION ORIENTED SUBJECT - I  
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I  
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II  
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III  
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV  
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V  
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application,-Microarray.

References  
SEMESTER – V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplasmic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER - VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT - I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT - II
Microbial decomposition; cellulose, Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles and Applications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I

Early development of virology – general properties of viruses- cultivation of Viruses- virus purification and assays. The structure of viruses- virion size-
General structure properties- helical capsids, icosohedral capsid- nucleic acids-
Viral envelopes and enzymes- virus classification.

UNIT- II

Reproduction of DNA phages- ds DNA lytic phages- lytic cycle of T4 phage
The one step growth- adsorption to the host cell and penetration- synthesis of Phage nucleic acids and protein assembly of phage particles- release of phage particles. Example of ss DNA phage- OX 174- circle replication.

UNIT-III

Lysogeny- temperate bacteriophages- lambda phage- induction of lysogens-

UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A,B).
Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References

SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT - I
Infections- sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of
epidemics.

UNIT - II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis,
Corynebacterium diphtheriae.

UNIT - III
Morphology, pathogenicity and laboratory diagnosis- Gram positive
Organisms- Clostridium perfringens, Clostridium tetani.

UNIT - IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative
organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella,
Pseudomonas, Vibrio cholerae.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium
Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira,
Chlamydias, Rickettsiae.

References
1. Mackie and Mc catney, 1994, Medical Microbiology No I and II. Churchill
Livingston, 14th edition.
Longman.
Calcutta.
Mosby Publications.
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange
Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II

MEDICAL MICROBIOLOGY - II

UNIT- I
Mycology: superficial infections- Dermatopytes- Microsporum – Trichophyton,
Epidermophyton- Madura mycosis- Opportunistic fungal infections- Candida
Albicans, Aspergillus, Mucor.

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris,
Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown
Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted
diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin
typing.

UNIT -V
Antibiotics and chemotherapeutic agents- Mechanism of actions – Drug
resistance – Antimicrobial susceptibility testing- Disc diffusion- Kirby Bauer
method.

References

Orient Longman.

Moshby Publications.

Brothers Medical Publishers (P) Ltd.

SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of E. coli plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus and Streptococcus pyogenes.
6. Identification of clinically important fungi – Candida albicans, Cryptococcus neoformans and Aspergillus
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – Aspergillus, Mucor, Penicillium, Rhizopus
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – Entamoeba, Plasmodium, Ascaris, Taenia.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III  
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY  

DIPLOMA PAPER 1  
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I  

UNIT – II  
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III  
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV  

UNIT – V  
Management of clinical Microbiology laboratory – general approaches – rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectorophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination -Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunoelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs                          Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert Koch    b) Louis Pasteur   c) Antony Von Leewenhock    d) Both b & c

2) Immunity mediated by antibodies are called as ________________
   a) Humoral    b) Cell mediated  c) Active    c) Passive

3) _______ is the ability of a lens to separate or distinguish between small objects that are close together.

4) _____________ is used as a counter stain in sparing staining
   a) Safranin    b) Methylene blue  c) Malachite green  d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP    b) TDT  c) D    d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um    b) 0.3 um  c) 0.4 um   d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms    b) Anaerobic organisms  
   c) Facultative anaerobic organisms    d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar    b) EMB agar  c) Both a & b    d) None of the above.

9) TVC refers to ________________
   a) Total viable count    b) Total viral count  c) Total viable colony   d) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant    b) Agar slant  c) Mineral oil overlay   d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and Koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discus the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II -MICROBIAL DIVERSITY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram (b) Similarity matrix (c) Dendrogram (d) None of the above
3. Which of the following is a motile bacterium
   (a) Escherichia coli (b) Klebsiella (c) Bacillus subtilis (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall (b) Colonies have fried egg appearance (c) Require sterols for growth (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast (b) Plastid (c) Thylakoid (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens (b) Halophiles (c) Thermophiles (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores (b) Zygosporos (c) Basidiospores (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores (b) Zygosporos (c) Conidiospores (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae (b) Green algae (c) Blue green algae (d) Brown algae
10. All the following are true about protozoa except
   (a) All members have cellwall (b) Move by flagella/pseudopodia (c) Unicellular (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) What is serotaxonomy? explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.

12. (a) Give distinguishing characters of clostridium. Or
   (b) State the important features and significance of enterobacteria.

13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.

14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium

15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
   (b) List out and describe the genetic characters used in taxonomy.

17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of bergeys manual and its importance.

18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples.

19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.

20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds

2. Polarly flagellated bacteria is known as
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane   (b) Mitochondria
   (c) Polyphosphate granules   (d) Periplasmic space

4. Features of nuclear envelope includes
   (a) Ribosomes   (b) A double membrane structure
   (c) Communication with cytoplasm   (d) Both b & c.

5. Insertional vectors are derived from
   (a) Bacterial plasmid   (b) Phage lambda  (c) M13 Phage   (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of
   (a) Phage   (b) Plasmid   (c) Plasmid and phage   (d) Fungi

7. Linked transport of two substances in the same direction is called
   (a) Antiport   (b) Facilitated diffusion   (c) Symport   (d) Passive diffusion

8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells   (b) Prokaryotic cells   (c) Both a & b   (d) None of the above

9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles   (b) Extreme thermophiles   (c) Acidophiles   (d) Osmophiles

10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage   (b) Ether linkage   (c) B 1-4 linkage   (d) Ionic linkage

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11. (a) Describe the capsule and slime layer of prokaryotic cell.   Or
    (b) Write a note on reserve materials.

12. (a) Explain the structure and functions of Endoplasmic reticulum.   Or
    (b) Write short notes on Nucleus.

13. (a) Give an account on cDNA synthesis.   Or
    (b) How will you purify plasmid DNA?

14. (a) Explain Facilitated diffusion.   Or
    (b) Write a note on phagocytosis and pinocytosis.

15. (a) Write a note on cell wall of Archaebacteria.   Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION – C (5X12=60 Marks)
Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization.   Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.

17. (a) Explain the structure and functions of Mitochondria and Chloroplasts.   Or
    (b) Write a brief account on eukaryotic cell wall.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.   Or
    (b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Write a brief note on active transport of nutrients in a bacterial cell.   Or
    (b) Give a brief account on group translocation mechanism.

20. (a) Give a brief account on Halophiles.   Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water  (b) Pigments  (c) Light  (d) H2S

2. *Thiobacillus thiooxidans* is an example of---------
   (a) Chemoautotrophs  (b) Heterotrophs  (c) Photoautotrophs  (d) Copiotrophs

3. The organisms which tolerate high pressure are called
   (a) Halotolerant  (b) Barotolerant  (c) Psychrophilic  (d) Thermotolerant

4. Chemostat is associated with
   (a) Synchronous culture  (b) Batch culture  (c) Continuous culture  (d) Diauxic growth

5. All the following are intermediates of TCA cycle except
   (a) Citric acid  (b) Fumaric acid  (c) Lactic acid  (d) Ketoglutaric acid

6. The two enzymes, transketolase and trans-aldolase are unique to which of the following pathways?
   (a) EMP  (b) ED  (c) HMP  (d) TCA cycle

7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound  (b) Oxygen  (c) Nitrogenous compound  (d) Carbon dioxide

8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*  (b) *Chlorella* sp  (c) *Klebsiella* sp  (d) *Escherichia coli*

9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water  (b) Sunlight  (c) H2S  (d) O2

10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid  (b) Carbohydrate  (c) Protein  (d) None of the above

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria.  Or
    (b) What are copiotrophs? Describe with suitable examples.

12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth.  Or
    (b) Give an account on Diauxic growth.

13. (a) Giving suitable example, describe substrate level phosphorylation.  Or
    (b) Describe ED pathway.

14. (a) Describe alcoholic fermentation.  Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.

15. (a) What is anoxygenic photosynthesis? Describe.  Or
    (b) Give a brief note on Bioluminescence.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria.  Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.

17. (a) Discuss in detail the different phases of growth.  Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway?. Or 
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or 
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or 
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.
1. Hot air oven functions based on the principle of
   a. dry air sterilization   b. moist air sterilization   c. membrane filtr   d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization   b. incineration   c. autoclave   d. oven.
3. Lyophilization is the
   a. separation of proteins   b. sudden freezing and dehydration   c. enzyme reaction by oxidation   d. high pressure–segmentation.
4. The pH is defined as
   a. logH⁺   b. log₂H⁺   c. -logH⁺   d. -log₂H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution   b. lead sulphate   c. anions   d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid   b. lipid   c. protein   d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solutio   b. nucleic acid   c. proteins   d. enzymes.
8. NPK analysis is done using
   a. electrophoresi   b. centrifugation.   c. flame photo   d. chromatography.
9. The pH of the blood is
   a. 6.3   b. 7.4   c. 7.0   d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
   b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology. with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs                                             Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV     b) Retrovirus  c) Pox     d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A     b) B     c) C     d) Z

3) -----------Enzyme resolves the super coiling during replication of *E.Coli*
   a) gyrase   b) helicase   c) polymerase   d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg c) Meselson &stahl   d) Hershey & Chase

5) ----------- no of codons constitute the coding dictionary
   a) 64  b) 61  c) 62  d) 60
6) CAP is involved in--------?-  
   a) Catabolic repression  b) Induction c) feed back inhibition   d) None of these
7) --------is an example for intercalating agent?  
   a) Acridine orange   b) EMS  c) Nitrous oxide  d) UV
8) Lex protein are involved in ----type of repair?  
   a) SOS  b) photoreactivation  c) Exision repair  d) all of the above
9) Davis-u-tube expt is used to prove the existence of--------?  
   a) Transformation  b) conjugation  c) transduction  d) recombination
10) Transformation was proved and demonstrated by------  
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA  OR  
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment  OR  
    b) Describe DNA polymerase
13) a) Explain the features of genetic code  OR  
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test  OR  
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction  OR  
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR  
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?  OR  
    b) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli  OR  
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?  OR  
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene  OR  
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as _______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) ____________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ____________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as _____________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to _______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as __________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as _________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ____________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION-B (5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus.  (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway.  (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction.  (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA  (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system.  (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION-C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier  (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity.  (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis  (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction.  
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system.  
      b) Give a brief note on the mechanisms involved in graft rejection.

**CORE PAPER VIII - FOOD MICROBIOLOGY**

Duration – 3hrs  
Maximum – 100 Marks

**SECTION A (10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti  
   (b) pyruvic acid  
   (c) fumaric acid  
   (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) *Serratia*  
   (b) *Flavobacterium*  
   (c) *Micrococcus*  
   (d) *Klebsiella*
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min  
   (b) 62.5°C, 30 min  
   (c) 71.7°C, 15 sec  
   (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) *Aspergillus*  
   (b) *Bacillus*  
   (c) *Saccharomyces*  
   (d) *Serratia*
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer  
   (b) sauerkraut  
   (c) soft drinks  
   (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather  
   (b) springer  
   (c) flipper  
   (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce  
   (b) yoghurt  
   (c) bread  
   (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) *Leuconostoc mesenteroides*  
   (b) *Streptococcus faecalis*  
   (c) *Pediococcus cerevisiae*  
   (d) *Staphylococcus aureus*
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample  
   (b) storage of sample at room temperature for 24 hr  
   (c) gathering information  
   (d) laboratory testing
10. The toxin produced by *Staphylococcus* sp in food is
   (a) an enterotoxin  
   (b) a neurotoxin  
   (c) a hepatotoxin  
   (d) a nephrotoxin.

**SECTION B (5X6=30 Marks) - Answer ALL Questions.**

11a) What is the significance of molds in food microbiology? Describe.  
(b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation.  
(b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe.  
(b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce.  
(b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)

b) Give a brief account of food standards.

**SECTION–C (5X12=60Marks)**

**Answer ALL Questions.**

16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)

b) What are the various factors that influence the growth of microorganisms in foods.

17a) Discuss the use of high temperature in food preservation. (or)

b) Discuss the principles of food preservation.

18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)

b) Discuss the biological spoilage of canned foods.

19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)

b) With neat flow chart describe the production of cheese.

20a) Describe in detail about food borne infections caused by bacteria. (or)

b) What are mycotoxins? Describe in detail with suitable examples.

**APPLICATION ORIENTED PAPER - I**

(Duration – 3hrs) Maximum – 75 Marks

**RECOMBINANT DNA TECHNOLOGY - I**

**SECTION A (10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. GAATTC is the recognition sequence of
   (a) BamHI  (b) EcoRI  (c) HindIII  (d) HaeIII

2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase  (b) E.coli ligase  (c) Sal ligase  (d) All

3. Phosphoramidite method is used for the synthesis of
   (a) DNA  (b) Protein  (c) Phosphatase  (d) Phosphoric acid

4. Plasmids are DNA strands which are
   (a) Extrachromosomal  (b) Double stranded  (c) Self replicating  (d) All the above

5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  (c) M13 Phage  (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi.

7. Colony hybridization technique is employed for
   (a) Selection of vector  (b) Unhybridised ones  (c) Selection of desirable clones  (d) None of the above

8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation  (b) Microinjection
   (c) Transformation  (d) None

9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus  (b) Thermus aquaticus
   (c) Thermobacter aquaticus  (d) Thermus aquaticae

10. Hybridisation technique used to detect protein in a gel is
     (a) Southern blot  (b) Northern blot  (c) Western blot  (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or
   (b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or
   (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or
   (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or
   (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or
    (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or
    (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
    (b) How will you identify the presence of rDNA in a cell?.
20. (a) Explain Southern blotting technique and its applications. Or
    (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs
aximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) ---------- are broad spectrum antiviral products
   a) Histones  b)IFN  c) Streptomycin  d)Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c)Xanthococcus  d) Zymomonas
3) ---------- is involved in the fusion of myloma cells with spleen cells
   a) PEG  b)PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as ----------
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) ---------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is ----------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c)Dinosaurs  d) Mice
8) __________ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) __________ marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION – B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
    d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application ad development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19) a) Discuss methodologies involved in the creation of transgenic mice also add
    b) Discuss about transgenic- goat, pig, birds and fish
    brief note on its application (or)
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a deailed essay explaining the course leading to the achievement of HGP
4. Batch culture is a________________
   a. open culture system   b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag    b. log    c. stationary    d. decline
7. The term single –cell protein was coined at-------- in 1966
   a. CFTRI, Mysore   b. Massachusetts Institute of technology
   c. MTCC   d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control   c. sterilization   d. packaging
10. Crystallization is an established method employed in the initial recovery of
   a. organic acid   b. amino acid   c. both   d. none

**SECTION-B(5X6=30Marks) - Answer ALL Questions.**
11.a. Discuss the significance of microbes in the production of commercially important products.
      (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture         (or)
      b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production. (or)
      b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making (or)
      b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods. (or)
      b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION-C(5X12=60Marks) - Answer ALL Questions.**
16.a. Give a detailed account on the various methods of strain improvement (or)
      b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor. (or)
      b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production. (or)
      b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast. (or)
      b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples. (or)
      b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) ---------------- is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an an example for ---------- degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) -------------- is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as ---------- in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability ----------- number of E.coli can present in 100 ml of water
   a) 1  b)0  c)10  d) 100

9) Application of alum is in ---------- phase of water treatment

10) Super Bug was developed and patented by ----------
    a) Khorana  b) Kohnberg  c) Chakraborty  d) Sanger

SECTION B (5X6=30 Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION C (5X12=60 Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A (10 x 1 = 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?
   (a) Bejerinck  
   (b) D. Ivanowski  
   (c) W. Stanley  
   (d) M. Theiler

2. The spikes are otherwise
   (a) Peplomers  
   (b) Capsid  
   (c) Envelope  
   (d) Coat

3. The one step growth experiment was developed by
   (a) Bejerinck  
   (b) D. Ivanowski  
   (c) W. Stanley  
   (d) Max Delbruck and Emory Ellis

4. Single stranded DNA phage is
   (a) T4 phage  
   (b) MS2  
   (c) QB  
   (d) O X 174

5. The process of release of the prophage from the bacterial DNA is called
   (a) Conduction  
   (b) Transfection  
   (c) Insertion  
   (d) Induction

6. The int gene codes for the synthesis of an
   (a) Integrase  
   (b) Ligase  
   (c) Excisionase  
   (d) Replicase

7. TMV has a Linked transport of two substances in the same direction is called
   (a) Non – infectious ss RNA  
   (b) Infectious ss RNA  
   (c) Non – infectious ss DNA  
   (d) Infectious ss DNA

8. Plant viruses penetrate the host cells through
   (a) Endodesmata  
   (b) Pore  
   (c) Echodesmata  
   (d) None of the above

9. In Herpes viridae the viral envelope adsorbs to the receptors on
   (a) Plasma membrane  
   (b) Cytoplasm  
   (c) Nucleus  
   (d) None of the above

10. For measles, the immunogen is
    (a) Active but attenuated  
    (b) Inactive but attenuated  
    (c) Inactive heat killed  
    (d) Inactivated

**SECTION – B (5X6=30Marks) - Answer ALL Questions.**

11. (a) Give an account on cultivation of viruses in egg yolk region.  
    Or  
    (b) Write a note on viral envelopes and enzymes.

12. (a) Explain the one step growth experiment.  
    Or  
    (b) Give an account on the structure of a typical bacterial virus.

13. (a) Give an account on reproduction of RNA phage.  
    Or  
    (b) Describe lysogenic conversion and its significance.

14. (a) Write a note on penetration and uncoating of viruses in the animal cell.  
    Or  
    (b) Write a note on characteristics of the viruses that infect algae and fungi.

15. (a) Write short notes on AIDS.  
    Or  
    (b) Give a brief outline on Rubella virus.

**SECTION – C (5X12=60Marks) - Answer ALL Questions.**

16. (a) Give a detailed account on viral purification and assay methods.  
    Or  
    (b) Give a brief account on the early development of virology.

17. (a) Explain briefly the reproduction of ds DNA T4 phage.  
    Or  
    (b) Give a detailed account on ss DNA phage.

18. (a) Describe the temperate bacteriophages and lysogeny.  
    Or  
    (b) Give a brief account on generation of defective phages and their uses.

19. (a) Explain briefly the reproduction of plant viruses.  
    Or  
    (b) Give a detailed account on viruses and cancer.

20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus.  
    Or  
    (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called a. immuned  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
5. Spot the Gram positive anaerobic endospore forming bacillus a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae a. SS agar  b. BSA  c. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is a. faeces  b. urine  c. sputum  d. blood

SECTION–B (5X5=25Marks) - Answer ALL Questions.
11.a. Define and differentiate carriers. (or)
    b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)
    b. Give the features of B.anthracis
13.a. Describe the methods for diagnosis to tetanus (or)
    b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)
    b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidia. (or)
    b. Give the features of Rickettsiae.

SECTION–C (5X8=40Marks) - Answer ALL Questions.
16.a. Elucidate the methods of transmission of infection with examples. (or)
    b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
    b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY— II

Duration – 3hrs
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
a) Hypha  b) Mycelium  c) Mould  d) Fungi

2. _______________ is an important opportunistic pathogen in HIV infected persons.
a) P. marneffci  b) P. notatum  c) Rhizopus  d) Mucor

3. Candidosis is caused mainly by _______________
a) C. albicans  b) C. tropicalis  c) C. pseudotropicalis  d) C. krusei

4. The major organism which causes urinary tract infection is ________________
a) E. coli  b) Salmonella  c) Shigella  d) Klebsiella

5. Traveller's diarrhea is caused by _______________
a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli  c) Enteroinvasive E. coli  d) Enterotoxigenic E.coli

6. Blue pus is caused by ________
   a) Pseudomonas  b) Vibrio  c) Salmonella  d) E. Coli

7. Sexually transmitted disease is caused by _______________
a) Treponema  b) Klebsiella  c) Proteus  d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as _______________
a) Septicemia  b) bacteremia  c) Viremia  d) Algemia

9. MIC denotes _______________
a) Maximum inhibitory concentration  b) Minimum inhibitory concentration  c) Multiple inhibitory concentration  d) None of the above

10. Endoflagella is a characteristic nature present in _______________
a) Spriochetes  b) Salmonella  c) Proteus  d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
   b) Describe candidiasis

12. a) Comment on Taenia solium  (or)  b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
   b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections.  (or)  b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance  (or)
   b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections  (or)
   b) Aspergillosis Describe.

17. a) Describe *Trichusis trichura*  (or)
   b) Comment on *Wucheraria bancrofti*

18. a) Describe the etiology and lab diagnosis of diarrhegenic *E.Coli* (or)
   b) Comment on pyogenic infections caused by *Staphylococcus*.

19. a) Comment on meningitis  (or)  b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria  (or)
   b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium  b) Glycerol saline medium  c) Cary Blair medium d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne  b) Ingestion  c) Direct inoculation  d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True  b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid  b) Blood  c) Semen  d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol  b) Sputolysin  c) Sputasol  d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol  b) Sodium hypochlorite  c) 2% Glutaraldehyde  d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium  b) Cooked meat medium  c) Saponin broth  d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA  b) ELISA  c) Western blot  d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium  b) Acid fast staining  c) Animal susceptibility  d) Fluorescent Microscopy.

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
b) Describe the procedures used for culturing anaerobic microorganisms.
17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.
18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
b) How can individual pathogenic viruses be identified in the lab.
19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.
20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs   Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample
2. All the following are acid fast except,
   a) *Mycobacterium*   b) *Actinomyces* c) *Nocardia* d) *Staphylococci*
3. The common medium used for growing *M tuberculosis* is
   a) Blood agar b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics IMViC+++--- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Klebsiella pneumoniae* c) *Proteus vulgaris*     d) *Pseudomonas aeruginosa*
5. Selective medium for *Staphylococci* is a) EMB agar b) BSA c) MSA d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm     b)24mm c)28mm d) 30mm
7. VDRL is an example for
   a) Agglutination b) Precipitation c) Complement fixation test d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh (D) - negative b) are “universal recipients” of transfusion
c) have circulating anti A and B antibodies d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen b) Antibody c) Antigen and Antibody d) None
10. Blotting of DNA is called
    a) Western blot   b) Southern blot   c) Northern blot d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.
11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.
12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.
13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.
14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.
15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.
17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.
18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.
19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.
20. a) What information is essential for the design of a pathogen specific nucleotide probe?
   Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II  
MYCOLOGY, PARASITOLOGY AND VIROLOGY  

Duration – 3hrs  
Maximum – 100 Marks  

SECTION A (10 x 1 = 10 Marks) 
Choose the correct answer for each from the FOUR alternatives given 

1. Growth medium for fungus inhibits growth of  
   a) Bacteria  b) Protozoa  c) Virus  d) helminth 
2. Germ tube technique is used to identify  
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor 
3. Following are true of Giardiasis except,  
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum  
   c) CFT is diagnostic  d) stools contain only cysts. 
4. Ingestion of contaminated pork may lead to infections of  
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis 
5. Of the following organisms, which has a bigger size?  
6. Hookworm infection is by  
   a) Ingestion of embryonated eggs  b) Larvae penetrating through the skin  
   c) Ingestion of larvae  d) the bite of insects 
7. Viruses can be cultivated is  
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth 
8. Which of the following is most specific in diagnosis of AIDS?  
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth 
9. The serobiological marker of acute Hepatitis B infection is  
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg 
10. Viruses are  
   a) Found primarily in soil  b) Obligate intracellular parasites  
   c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope. 

SECTION – B (5X6=30 Marks) - Answer ALL Questions. 

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)  
   b) Name the different media used for fungal pathogen isolation and identification. 
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)  
   b) Add a note on media for parasite isolation. 
13. a) Why do most protozoan diseases occur in the tropics. (OR)  
   b) How do infections caused by Entamoeba histolytica occur? 
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)  
   b) Describe some clinical manifestations caused by the acute respiratory viruses. 
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)  
   b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dermatophytooses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Piasmodium*. (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

Group A: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

Group B: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

Group C: application oriented subjects: 2 subjects – 4 papers
The application –oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

Group D: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

Diploma Programme:
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) Co-Curricular activities: NSS/NCC/Physical education
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

   a) A candidate will be permitted to appear for the university examinations for any semester if
      i) He/she secures not less than 75% of attendance in the number of working days during the semester.
      ii) He/she earns a progress certificate from the head of the institution, of having satisfactorily completed the course of study prescribed in the subjects as required by these regulations, and
      iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**
   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**
   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**
   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).
   
   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**
   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**
   a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**
   
   b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**
   
   (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**
   
   (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise /amend/ change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
## SCHEME OF EXAMINATIONS

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*NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I

CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_). Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I
Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II

UNIT -III

UNIT- IV
Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V
Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT -III


UNIT – IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GRA CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological in vitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application, -Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I
Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II
Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III

UNIT- IV
Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V
Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastecoir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I

Early development of virology – general properties of viruses- cultivation of Viruses- virus purification and assays. The structure of viruses- virion size-
General structure properties- helical capsids, icosohedral capsid- nucleic acids-
Viral envelopes and enzymes- virus classification.

UNIT- II

Reproduction of DNA phages- ds DNA lytic phages- lytic cycle of T4 phage
The one step growth- adsorption to the host cell and penetration- synthesis of Phage nucleic acids and protein assembly of phage particles- release of phage particles. Example of ss DNA phage- OX 174- circle replication.

UNIT-III

Lysogeny- temperate bacteriophages- lambda phage- induction of lysogens-

UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A.B).
Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References


SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diptheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.

UNIT -V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydia, Rickettsiae.

References
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT - I
Mycology: superficial infections- *Dermatophytes* - *Microsporum* – *Trichophyton*,
*Epidermophyton* - *Madura mycosis* - Opportunistic fungal infections- *Candida*
Albicans, *Aspergillus, Mucor*.

UNIT - II
Parasitic diseases- *Plasmodium vivax*, *Giardia, Taenia solium*, *Ancylostoma, Ascaris*,
*Wuchereria bancrofti*, *Enterobius, Trichuris trichura*.

UNIT - III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown
Origin meningitis, diarrhea, respiratory tract infections.

UNIT - IV
Pyogenic infections- *Staphylococcus* and *Pseudomonas*: sexually transmitted
diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin
typing.

UNIT - V
Antibiotics and chemotherapeutic agents- Mechanism of actions – Drug
resistance – Antimicrobial susceptibility testing- Disc diffusion- Kirby Bauer
method.

References
Orient Longman.
Moshby Publications.
Brothers Medical Publishers (P) Ltd.
SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli*, *Klebsiella pneumoniae*, *Proteus*, *Salmonella*, *Shigella*, *Pseudomonas*, *Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans*, *Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus*, *Mucor*, *Penicillium*, *Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization - Demonstration
15. Observation of parasites – *Entamoeba*, *Plasmodium*, *Ascaris*, *Taenia*.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III  
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY  

DIPLOMA PAPER 1  
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY  

UNIT –I  

UNIT – II  
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.  

UNIT – III  
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.  

UNIT – IV  

UNIT – V  
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.  

References  

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.  

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.  


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References

SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination -Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- *Entamoeba, Plasmodium, Ascaris, Taenia*
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs                                                                 Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert koch b) Louis Pasteur c) Antony Von Leewenhock d) Both b & c

2) Immunity mediated by antibodies are called as ________________
   a) Humoral b) Cell mediated c) Active d) Passive

3) ______ is the ability of a lens to separate or distinguish between small objects that are close together.

4) __________ is used as a counter stain in spare staining
   a) Safranin b) Methylene blue c) Malachite green d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP b) TDT c) D d) None of the above.

6) HEPA filters can remove particles of size ____________
   a) 0.2 um b) 0.3 um c) 0.4 um d) 0.5 um

7) McIntosh fieldes jar method is used for cultivating ________________
   a) Aerobic organisms b) Anaerobic organisms c) Facultative anaerobic organisms d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar b) EMB agar c) Both a & b d) None of the above.

9) TVC refers to ____________
   a) Total viable count b) Total viral count c) Total viable colony d) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant b) Agar slant c) Mineral oil overlay d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram (b) Similarity matrix (c) Dendrogram (d) None of the above
3. Which of the following is a motile bacterium
   (a) Esherichia coli (b) Klebsiella (c) Bacillus subtilis (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall (b) Colonies have fried egg appearance (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast (b) Plastid (c) Thylakoid (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens (b) Halophiles (c) Thermophiles (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores (b) Zygospores (c) Basidiospores (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores (b) Zygospores (c) Conidiospores (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae (b) Green algae (c) Blue green algae (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall (b) Move by flagella/pseudopodia
    (c) Unicellular (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) What is serotaxonomy? explain. Or 
   (b) Describe any two important characteristics used in serotaxonomy.

12. (a) Give distinguishing characters of clostridium. Or 
   (b) State the important features and significance of enterobacteria.

13. (a) Compare the cell walls of eubacteria and archaebacteria. Or 
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.

14. (a) Explain the life cycle of Mucor Or 
   (b) Describe briefly the life cycle of Dictyostelium

15. (a) Give a brief account of pseudopodia. Or 
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or 
   (b) List out and describe the genetic characters used in taxonomy.

17. (a) What are the general characteristics of actinomycetes? Describe. Or 
   (b) Give a detailed account of Bergey's manual and its importance.

18. (a) Summarise the major characteristics of archaebacteria. Or 
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples

19. (a) Discuss in detail the general characteristics of fungi. Or 
   (b) With neat diagram describe the life cycle of Agaricus.

20. (a) Describe the general characters and the importance of Chlorophyta and Phaeophyta. Or 
   (b) Explain the general characters of Sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)  Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan  (b) Lipopolysaccharide  (c) Peptidoglycan + Lipopolysaccharide+ compounds  (d) other compounds

2. Polavly flagellated bacteria is known as --------------
   (a) Lophotrichous  (b) Peritrichous  (c) Atrichous  (d) Axial filaments
3. Where does energy production occurs in eukaryotes?
   (a) Cytoplasmic membrane  (b) Mitochondria
   (c) Polyphosphate granules  (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes  (b) A double membrane structure
   (c) Communication with cytoplasm  (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  (c) M13 Phage  (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport  (b) Facilitated diffusion  (c) Symport  (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells  (b) Prokaryotic cells  (c) Both a & b  (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles  (b) Extreme thermophiles  (c) Acidophiles  (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage  (b) Ether linkage  (c) B 1-4 linkage  (d) Ionic linkage

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast.. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                                  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use -------- as source of energy
   (a) Water          (b) Pigments     (c) Light     (d)H2S

2. *Thiobacillus thiooxidans* is an example of---------
   (a)Chemoautotrophs (b)Heterotrophs (c)Photoautotrophs d)Copiotrophs

3. The organisms which tolerate high pressure are called
   (a) Halotolerant      (b) Barotolerant  (c) Psychrophilic       (d)Thermotolerant

4. Chemostat is associated with
   (a) Synchronous culture  (b)Batch culture (c) Continous culture   (d)Diauxic growth

5. All the following are intermediates of TCA cycle except
   (a) Citric acid       (b) Fumaric acid    (c) Lactic acid    (d) ketoglutaric acid

6. The two enzymes ,transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP             (b) ED                 (c) HMP               (d)TCA cycle

7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound (b)Oxygen       (c) Nitrogenous compound (d) Carbondioxide

8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae* (b)Chlorella sp  (c) Klebsiella sp   (d) *Escherichia coli*

9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water          (b) Sunlight     (c)H2S          (d) O2

10. The carrier molecule in cell- wall biosynthesis is a----
    (a) Lipid    (b) Carbohydrate   (c)Protein          (d) None of the above

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
   (b) What are copiotrophs? Describe with suitable examples.

12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
   (b) Give an account on Diauxic growth.

13. (a) Giving suitable example , describe substrate level phosphorylation. Or
   (b) Describe ED pathway.

14. (a) describe alcoholic fermentation. Or
   (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.

15. (a) What is anoxygenic photosynthesis ? Describe. Or
   (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram , describe the event of endospore formation in bacteria. Or
   (b) With suitable examples , classify bacteria based on their nutritional requirements.

17. (a) Discuss in detail the different phases of growth.. Or
   (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway?  Or  
(b) What is oxidative phosphorylation? Describe.  
19. (a) Explain briefly the propionic acid fermentation.  Or  
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.  
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall.  Or  
(b) Describe the C3 pathway of Co2 fixation.  

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS  

Duration – 3hrs  Maximum – 100 Marks  

SECTION A ( 10 x 1= 10 Marks)  
Choose the correct answer for each from the FOUR alternatives given.  
1. Hot air oven functions based on the principle of  
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.  
2. Moist heat sterilization is achieved by  
   a. lyophilization  b. incineration  c. autoclave  d. oven.  
3. Lyophilization is the  
   a. separation of proteins    b. sudden freezing and dehydration  
   c. enzyme reaction by oxidation    d. high pressure–segmentation.  
4. The pH is defined as  
   a. logH⁺  b. log2H⁺  c. -logH⁺  d. -log2H⁺  
5. Which is used as an absorbent in TLC.  
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel  
6. SDS-PAGE is used to separate  
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.  
7. UV light is significantly absorbed by  
   a. coloured solution  b. nucleic acid  c. proteins  d. enzymes.  
8. NPK analysis is done using  
   a. electrophoresis  b. centrifugation.  c. flame photometry  d. chromatography.  
9. The pH of the blood is  
   a. 6.3    b. 7.4    c. 7.0    d. 7.6  
10. What is the normality of 5M NaOH solution?  

SECTION –B(5X6=30Marks) - Answer ALL Questions.  
11.a. With a schematic diagram, describe the working of a laminar flow chamber.  (or) 
  b. Explain the working of an incubator.  
12.a. Explain the electrodes used in pH measurement.  (or) 
  b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.  
13.a. What is paper chromatography?  (or)  
  b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry.  
   b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml/g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”

   (or)

   b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge.  
   (or)

   b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications.  
   (or)

   b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography.  
   (or)

   b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter?  
   (or)

   b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology.
   with their applications  
   (or)

   b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs  
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in -------- to prove that the RNA also act as genetic material
   a) TMV  b) Retrovirus  c) Pox  d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A  b) B  c) C  d) Z

3) -------- Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase  b) helicase  c)polymerase  d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg c) Meselson &stahl  d) Hershey & Chase

5) -------- no of codons constitute the coding dictionary
   a) 64  b) 61  c) 62  d) 60
6) CAP is involved in----------?
   a) Catabolic repression  b) Induction  c) feed back inhibition      d) None of these
7) ----------is an example for intercalating agent?
   a) Acridine orange  b) EMS  c) Nitrous oxide   d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair d) all of the above
9) Davis-u-tube expt is used to prove the existance of--------?
   a) Transformation  b) conjugation   c) transduction d0 recombination
10) Transformation was proved and demonstrated by-----
   a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA              OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment          OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code          OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test                            OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell? OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage? OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) ________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator  c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ________________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ________________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or) 
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or) 
   b) Give a brief note on the mechanisms involved in graft rejection.

**CORE PAPER VIII - FOOD MICROBIOLOGY**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A (10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of 
   (a) lacti  (b) pyruvic acid  (c) fumaric acid  (d) aminoacids
2. All the following genera of bacteria produce pigments except 
   (a) Serratia  (b) Flavobacterium  (c) Micrococcus  (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of 
   (a)62.8C, 30 min  (b)62.5C,30 min  (c) 71.7C, 15 sec  (d) 71.7C, 15 min
4. Ropiness of bread is caused by species of 
   (a) Aspergillus  (b) Bacillus  (c) Saccharomyces  (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except 
   (a) beer  (b)sauerkraut  (c)soft drinks  (d) fruit juice
6. A can with a minute leak during storage is called a 
   (a) breather  (b) springer  (c)flipper  (d) sparger
7. The term leavening is associated with the preparation of 
   (a) soy sauce  (b)yoghurt  (c) bread  (d)cheese
8. All the following organisms contribute to acidity in idli batter except 
   (a) Leuconostoc mesenteroides  (b) Streptococcus faecalis  
   (c) Pediococcus cerevisiae  (d)Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks 
   (a) collection of sample  (b) storage of sample at room temperature for 24 hr  
   (c) gathering information  (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is 
   (a) an enterotoxin  (b)a neurotoxin  (c) a hepatotoxin  (d) a nephrotoxin.

**SECTION-B (5X6=30Marks) - Answer ALL Questions.**

11a) What is the significance of molds in food microbiology? Describe. (or) 
   b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)  
   b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or) 
   b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)  
   b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.
19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs
Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI  (b) EcoRI  (c) HindIII  (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase  (b) E.coli ligase  (c) Sal ligase  (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA  (b) Protein  (c) Phosphatase  (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosomal  (b) Double stranded  (c) Self replicating  (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  (c) M13 Phage  (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi.
7. Colony hybridization technique is employed for
   (a) Selection of vector  (b) Unhybridised ones  (c) Selection of desirable clones  (d) None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation  (b) Microinjection
   (c) Transformation  (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus  (b) Thermus aquaticus
   (c) Thermobacter aquaticus  (d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot  (b) Northern blot  (c) Western blot  (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or
   (b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or
   (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or
   (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or
   (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or
    (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or
    (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
    (b) How will you identify the presence of rDNA in a cell?
20. (a) Explain Southern blotting technique and its applications. Or
    (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs
aximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) ---------- are broad spectrum antiviral products
   a) Histones b) IFN c) Streptomycin d) Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida b) Xanthomonas campestris c) Xanthococcus d) Zymomonas
3) ---------- is involved in the fusion of myloma cells with spleen cells
   a) PEG b) PGA c) IPTG d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as ----------
   a) Subunit b) Whole cell c) Antiidiotype d) Peptide
5) ---------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes b) Right border c) Left border d) IAA
6) Nopaline is ----------
   a) Unusual Amino acid b) Nucleotide c) Vitamin d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey b) Snake c) Dinosuars d) Mice
8) ______ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) ______ marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
    d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application ad development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19 a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs                                Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in ______________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a __________________
   a. open culture system    b. system that maintains constant cell conc.
   c. system with addition of nutrients    d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product    b. Vitamin B12 as a by product
   c. Vitamin C as a by product    d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag    b. log    c. stationary    d. decline
7. The term single -cell protein was coined at-------- in 1966
   a. CFTRI, Mysore    b. Massachusetts Institute of technology
   c. MTCC    d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol    b. methane    c. oil    d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery    b. quality control    c. sterilization    d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid    b. amino acid    c. both    d. none

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. Discuss the significance of microbes in the production of commercially important products.
      (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture    (or)
      b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.    (or)
      b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making    (or)
      b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.    (or)
      b. Write short notes on batch filters that are employed in down streaming processing.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Give a detailed account on the various methods of strain improvement    (or)
      b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.    (or)
      b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.    (or)
      b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.    (or)
      b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.    (or)
      b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given.

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) ------------ is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an an example for ---------- degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) ------------ is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as ---------- in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability ------------ number of E.coli can present in 100 ml of water
   a) 1  b)0  c)10  d) 100

9) Application of alum is in -------- phase of water treatment

10) Super Bug was developed and patented by ----------
   a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION–B(5X6=30 Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
11b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
12b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
13b) Explain carbon cycle

14a) Discuss MPN technique (or)
14b) Explain Eutrophication

15a) Describe Air pollution (or)
15b) Explain the methodology involved in Microbiological Air quality

SECTION–C(5X12=60 Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
16b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
17b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
18b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
19b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
20b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV? (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) M. Theiler
2. The spikes are otherwise (a) Peplomers  (b) Capsid  (c) Envelope  (d) Coat
3. The one step growth experiment was developed by (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is (a) T4 phage  (b) MS2  (c) QB  (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called (a) Conduction  (b) Transfection  (c) Insertion  (d) Induction
6. The int gene codes for the synthesis of an -------- enzyme (a) Integrase  (b) Ligase  (c) Excisionase  (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA  (b) Infectious ss RNA  (c) Non – infectious ss DNA  (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through (a) Endodesmata  (b) Pore  (c) Echodesmata  (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane  (b) cytoplasm  (c) Nucleus  (d) None of the above
10. For measles, the immunogen is (a) Active but attenuated  (b) Inactive but attenuated  (c) Inactive heat killed  (d) Inactivated

SECTION – B (5X6 = 30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or (b) Give a brief outline on Rubella virus.

SECTION – C (5X12 = 60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs

Maximum – 75 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease
   a. Malaria       b. filariasis   c. plaque   d. all the above
2. Persons with symptomless infection is called
   a. immuned       b. carrier   c. vector   d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococci   b. staphylococci   c. Pseudomonas   d. Vibrio
4. Toxigenecity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus   b. Corynebacterium   c. Clostridium   d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease   b. lock jaw   c. hepatitis   d. rabies
7. Food borne intoxication is caused by a. Salmonella   b. E.coli   c. Shigell   d. Staphylococcus
8. Darting motility is seen with a. E.coli   b. Streptococcus   c. V.cholerae   d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar       b. BSA   d. LJ   d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces   b. urine   c. sputum   d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a. Define and differentiate carriers. (or)
    b. State Koch postulates.

12. a. Give the features of Streptococcus. (or)
    b. Give the features of B.anthracs

13. a. Describe the methods for diagnosis to tetanus (or)
    b. Describe the methods for diagnosis of gas gangrene.

14. a. Write a short note on enteric fever. (or)
    b. Write a short note on bacillary dysentery.

15. a. Give the features of Chlamidiae. (or)
    b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16. a. Elucidate the methods of transmission of infection with examples. (or)
    b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.

17. a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
    b. Give an account of Staphylococcus aureus its morphology and diagnosis.

18. a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.

19. a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.

20. a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs  Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha  b) Mycelium  c) Mould  d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci  b) P. notatum  c) Rhizopus  d) Mucor

3. Candiosis is caused mainly by ________________
   a) C. albicans  b) C. tropicalis  c) C. pseudotropicalis  d) C. krusei

4. The major organism which causes urinary tract infection is ________________
   a) E. coli  b) Salmonella  c) Shigella  d) Klebsiella

5. Traveller's diarrhea is caused by ________________
   a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli  d) Enterotoxigenic E.coli

6. Blue pus is caused by ______
   a) Pseudomonas  b) Vibrio  c) Salmonella  d) E. Coli

7. Sexually transmitted disease is caused by ________________
   a) Treponema  b) Klebsiella  c) Proteus  d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as ________________
   a) Septicemia  b) bacteremia  c) Viremia  d) Algemia

9. MIC denotes __________________
   a) Maximum inhibitory concentration  b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration  d) None of the above

10. Endoflagella is a characteristic nature present in ________________
    a) Spirochetes  b) Salmonella  c) Proteus  d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium  (or) b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections.  (or)
    b) Describe respiratory tract infections.

14.a) Describe briefly on pyogenic infections.  (or)  b) Comment on Pseudomonas.

15.a) Explain the mechanism of drug resistance     (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16.a) Add a note on opportunistic fungal infections  (or)
    b) Aspergillosis Describe.

17.a) Describe Trichus trichura  (or)
    b) Comment on Wucheraria bancrofti

18.a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19.a) Comment on meningitis  (or)  b) Describe pyrexia

20.a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.
2. All the following are transport media except,
   a) Stuarts medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth
3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.
4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False
5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF
6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme
7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform
8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth
9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR
10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
   a) Culturing on LJ medium
   b) Acid fast staining
   c) Animal susceptibility
   d) Fluorescent Microscopy.

SECTION B (5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
   b) How will you design a microbiology laboratory for a multispeciality hospital?
12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
   b) How will you handle any mishaps with infective materials in the laboratory.
13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
   b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.
14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
   b) Comment on the laboratory requisition form.
15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
   b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION – C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample

2. All the following are acid fast except,
   a) *Mycobacterium*    b) *Actinomycetes*    c) *Nocardia*    d) *Staphylococci*

3. The common medium used for growing *M tuberculosis* is
   a) Blood agar b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*    b) *Kiebsiella pneumoniae*    c) *Proteus vulgaris*    d) *Pseudomonas aeruginosa*

5. Selective medium for *Staphylococci* is a) EMB agar b) BSA c) MSA d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm b) 24mm c) 28mm d) 30mm

7. VDRL is an example for
   a) Agglutination b) Precipitation c) Complement fixation test d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (D) - negative    b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies    d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen    b) Antibody    c) Antigen and Antibody    d) None

10. Blotting of DNA is called
    a) Western blot    b) Southern blot    c) Northern blot    d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.
11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.
12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.
13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.
14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.
15. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.
16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.
17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.
18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.
19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.
20. a) What information is essential for the design of a pathogen specific nucleotide probe? Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs                                            Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Growth medium for fungus inhibits growth of
   a) Bacteria b) Protozoa c) Virus d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus b) Candida c) Saccharomyces d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon b) Trophozoites and cyst are found in duodenum
c) CFT is diagnostic d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium b) Taenia saginata c) Taenia corporis d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a) Entamoeba histolytica b) Entamoeba coli c) Entamoeba hartmanni d) Escherichia coli.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs  b) Larvae penetrating through the skin
   b) Ingestion of larvae d) the bite of insects
7. Viruses can be cultivated in
   a) Nutrient agar b) Cell culture c) Corn meal agar d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA b) IHA c) Immunoelectrophoresis d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg b) HBsAg + HBcAg c) HBsAg + Core antibody d) HBeAg
10. Viruses are
    a) Found primarily in soil b) Obligate intracellular parasites
        c) Can be cultivated in nutrient agar d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing
    another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically
    was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by *Entamoeba histolytica* occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about
    what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dennatophytooses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Piasmodium*. (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**

Candidate for admission to the first year of the **B.Sc., Microbiology** degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology / Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**

The course of study for the UG degree courses of all branches shall consist of the following

a) **Part - I**

Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

The subject shall be offered during the first four semesters with one examination at the end of each semester.

b) **Part – II : English**

The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

c) **Foundation Course**

The Foundation course shall comprise of two stages as follows:

- **Foundation Course A : General Awareness (I & II semesters)**
- **Foundation Course B : Environmental Studies (III & IV semesters)**

The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.

- From the printed material supplied by the University - 75%
- Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) **Part – III**

**Group A**: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester.

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme**:  
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows:

- A-Exemplary
- B-very good
- C-good
- D-fair
- E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

   a) A candidate will be permitted to appear for the university examinations for any semester if

   i) He/she secures not less than 75% of attendance in the number of working days during the semester.

   ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and

   iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

    a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**.

    b) i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**.

       ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**.

       iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**.
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he/she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from the manner prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for Part III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
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<th>Sem</th>
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|     |      | B.Sc., Microbiology | | 3200 |
|     |      | Diploma in Diagnostic Microbiology | | 400 |

* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaeabacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

   nd edition Wm, C. Brown publishers.
   th edition, Tata Mc Hill Publishing Company Ltd.,
SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and CO2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References

2. Tortora , Funke and case . Microbiology , 8th edition
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave , Hot air oven , Incubator , Water Bath , Laminar air flow, BOD incubator, Centrifuges – Bench top , High sped , Ultra centrifuge.

UNIT – II

pH meter , Conductivity meter, Lyophilizer , McIntosh anaerobic jar , Biosensor, Metabolic shaker.

UNIT -III


UNIT – IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
**SEMESTER IV**
**GR A CORE PRACTICAL II**

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al/Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

**SEMESTER - V**
**CORE PAPER VI - MICROBIAL GENETICS**

**UNIT-I**
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

**UNIT-II**
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

**UNIT-III**

**UNIT-IV**
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

**UNIT-V**
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

**References**
2. Freifelder, S., 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radioimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT - III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT- IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lambda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological in vitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northern) Techniques, RFLP and Application, - RAPD and Application.-Microarray.

References
SEMESTER – V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - II

UNIT – I

Microbial synthesis of commercial products - Proteins - Pharmaceuticals – Interferons - Human growth hormone- Antibiotics - Biopolymers.

UNIT – II

Vaccines – subunit vaccines – Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT – III

Transgenic plants - Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT - V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT - IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose, Hemi cellulose, lignin, pectin and chitin. – Factors influencing degradation- acetate utilization -bioconversion of organic wastes- sugarcane wastes-coir pith composition- composting, principles and Applications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References

SEMESTER - VI
CORE PAPER XI - VIROLOGY

UNIT - I

Early development of virology – general properties of viruses- cultivation of Viruses- virus purification and assays. The structure of viruses- virion size-
General structure properties- helical capsids, icosohedral capsid- nucleic acids-
Viral envelopes and enzymes- virus classification.

UNIT- II

Reproduction of DNA phages- ds DNA lytic phages- lytic cycle of T4 phage
The one step growth- adsorption to the host cell and penetration- synthesis of Phage nucleic acids and protein assembly of phage particles- release of phage particles. Example of ss DNA phage- OX 174- circle replication.

UNIT-III


UNIT - IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A,B).
Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References
SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT - I
Infections - sources of infections - types of infections - methods of infections - definitions - epidemic, pandemic, endemic diseases - Epidemiology of infectious diseases, infectious diseases cycle - investigation of epidemics - control of epidemics.

UNIT - II
Morphology, pathogenicity and laboratory diagnosis - Gram positive organisms *Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diptheriae*.

UNIT - III
Morphology, pathogenicity and laboratory diagnosis - Gram positive Organisms - *Clostridium perfringens, Clostridium tetani*.

UNIT - IV
Morphology, pathogenicity and laboratory diagnosis - Gram negative organisms *Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae*.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis - *Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydas, Rickettsiae*.

References
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT - I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References


SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli*, *Klebsiella pneumoniae*, *Proteus*, *Salmonella*, *Shigella*, *Pseudomonas*, *Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans*, *Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus*, *Mucor*, *Penicillium*, *Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba*, *Plasmodium*, *Ascaris*, *Taenia*.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT – I
Diagnostic microbiology – Purpose and philosophy. Purpose of diagnostic microbiology –

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to
microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology,
Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV
Laboratory organization and quality assurance – specimen procurement and identification –
laboratory requisition form – reporting results – procedure manual – Quality assurance and
statistics.

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection –
speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough
(ELBS) Tropical health technology butter worth’s, 1985.

medical publications USA.

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectorophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunoelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs                                                Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1) Who is called as "Father of Microbiology"?
   a) Robert koch      b) Louis Pasteur    c) Antony Von Leewenhock   d) Both b & c
2) Immunity mediated by antibodies are called as ____________
   a) Humoral          b) Cell mediated    c) Active        c) Passive
3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.
4) ___________ is used as a counter stain in spare staining
   a) Safranin         b) Methylene blue   c) Malachite green       d) Crystal violet
5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP              b) TDT              c) D                    d) None of the above.
6) HEPA filters can remove particles of size ____________
   a) 0.2 um           b) 0.3 um          c) 0.4 um       d) 0.5 um
7) McIntosh fildes jar method is used for cultivating ____________
   a) Aerobic organisms b) Anaerobic organisms c) Facultative anaerobic organisms d) Microphilic organisms
8) _______________ is an example for selective media.
   a) Mac conkey agar  b) EMB agar        c) Both a & b      d) None of the above.
9) TVC refers to ____________
   a) Total viable count b) Total viral count c) Total viable colony  d) None of the above.
10) _______________ is an example for short term preservation of microbes.
    a) Agar slant      b) Agar slant       c) Mineral oil overlay  d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.
11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theroy of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.
12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.
13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.
14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.
15) a) Discuss about the Co₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - AnswerALLQuestions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

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CORE PAPER II -MICROBIAL DIVERSITY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain   (b) Genus   (c) Species   (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram   (b) Similarity matrix   (c) Dendrogram   (d) None of the above
3. Which of the following is a motile bacterium
   (a) Esherichia coli   (b) Klebsiella   (c) Bacillus subtilis   (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall   (b) Colonies have fried egg appearance   (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast   (b) Plastid   (c)Thylakoid   (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens   (b) Halophiles   (c) Thermophiles   (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores   (b)Zygospores   (c) Basidiospores   (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores   (b) Zygospores   (c) Conidiospores   (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae   (b) Green algae   (c) Blue green algae   (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall   (b) Move by flagella/pseudopodia
        (c) Unicellular   (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples
14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of Bergeys Manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Chlorophyta and phaeophyta. Or
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds
2. Polarly flagellated bacteria is known as
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**

11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

**SECTION–C(5X12=60Marks)
Answer ALL Questions.**

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                                      Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ________ as source of energy
   (a) Water    (b) Pigments    (c) Light    (d) H2S
2. *Thiobacillus thiooxidans* is an example of__________
   (a) Chemoautotrophs    (b) Heterotrophs    (c) Photoautotrophs    (d) Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant    (b) Barotolerant    (c) Psychrophilic    (d) Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture    (b) Batch culture    (c) Continuous culture    (d) Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid    (b) Fumaric acid    (c) Lactic acid Insertion    (d) Ketoglutaric acid
6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP    (b) ED    (c) HMP    (d) TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound    (b) Oxygen    (c) Nitrogenous compound    (d) Carbon dioxide
8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*    (b) *Chlorella sp*    (c) *Klebsiella sp*    (d) *Escherichia coli*
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water    (b) Sunlight    (c) H2S    (d) O2
10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid    (b) Carbohydrate    (c) Protein    (d) None of the above

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.
13. (a) Giving suitable example, describe substrate level phosphorylation. Or
    (b) Describe ED pathway.
14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a) What is anoxygenic photosynthesis? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria. Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway?. Or 
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or 
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or 
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization  
   b. moist air sterilization  
   c. membrane filtr  
   d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization  
   b. incineration  
   c. autoclave  
   d. oven.
3. Lyophilization is the
   a. separation of proteins  
   b. sudden freezing and dehydration  
   c. enzyme reaction by oxidation  
   d. high pressure–segmentation.
4. The pH is defined as
   a. logH+  
   b. log2H+  
   c. -logH+  
   d. -log2H+.
5. Which is used as an absorbent in TLC.
   a. KCl solution  
   b. lead sulphate  
   c. anions  
   d. silica gel.
6. SDS-PAGE is used to separate
   a. nucleic acid  
   b. lipid  
   c. protein  
   d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solutio  
   b. nucleic acid  
   c. proteins  
   d. enzymes.
8. NPK analysis is done using
   a. electrophoresi  
   b. centrifugation.  
   c. flame photo  
   d. chromatography.
9. The pH of the blood is
   a. 6.3  
   b. 7.4  
   c. 7.0  
   d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. With a schematic diagram, describe the working of a laminar flow chamber.  (or)
   b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement.  (or)
    b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography?  (or)
    b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology. with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV   b) Retrovirus   c) Pox   d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A   b) B   c) C   d) Z

3) -------- Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase   b) helicase   c) polymerase   d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad   b) Tautam &Lederberg   c) Meselson &stahl   d) Hershey & Chase

5) --------- no of codons constitute the coding dictionary
   a) 64   b) 61   c) 62   d) 60
6) CAP is involved in--------?  
   a) Catabolic repression   b) Induction c) feed back inhibition       d) None of these
7) ----------is an example for intercalating agent?  
   a) Acridine orange   b) EMS   c) Nitrous oxide   d) UV 
8) Lex protein are involved in ----type of repair?  
   a) SOS   b) photoreactivation   c) Exision repair d) all of the above
9) Davis-u-tube expt is used to prove the existance of--------? 
   a) Transformation b) conjugation   c) transduction d) recombination
10) Transformation was proved and demonstrated by----- 
    a) Griffith   b) Sanger   c) Grick   d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA         OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment       OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test OR
    b) Discuss photoreactivation 
15) a) Discuss briefly specialized transduction OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell? OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA 
19) a) Explain how the organism protects its DNA from damage? OR
    b) Explain the phenomenon involved in generation of mutants? 
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as _______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) ________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to _______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as __________
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as __________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as __________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus.  (or)

    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway.  (or)

    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction.  (or)

    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA  (or)

    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system.  (or)

    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier  (or)

    b) Define and describe MALT.

17) a) Describe the types of immunity.  (or)

    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis  (or)

    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)  
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)  
   b) Give a brief note on the mechanisms involved in graft rejection.

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**CORE PAPER VIII - FOOD MICROBIOLOGY**

**Duration** – 3hrs  
**Maximum** – 100 Marks

**SECTION A (10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of  
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) amino acids  
2. All the following genera of bacteria produce pigments except  
   (a) *Serratia* (b) *Flavobacterium* (c) *Micrococcus* (d) *Klebsiella*  
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of  
   (a) 62.8°C, 30 min (b) 62.5°C, 30 min (c) 71.7°C, 15 sec (d) 71.7°C, 15 min  
4. Ropiness of bread is caused by species of  
   (a) *Aspergillus* (b) *Bacillus* (c) *Saccharomyces* (d) *Serratia*  
5. Filtration is a suitable method of removal of microorganisms from the following except  
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice  
6. A can with a minute leak during storage is called a  
   (a) breather (b) springer (c) flipper (d) sparger  
7. The term leavening is associated with the preparation of  
   (a) soy sauce (b) yoghurt (c) bread (d) cheese  
8. All the following organisms contribute to acidity in idli batter except  
   (a) *Leuconostoc mesenteroides* (b) *Streptococcus faecalis* (c) *Pediococcus cerevisiae* (d) *Staphylococcus aureus*  
9. Which of the following should be avoided while investigating food poisoning outbreaks  
   (a) collection of sample (b) storage of sample at room temperature for 24 hr (c) gathering information (d) laboratory testing  
10. The toxin produced by *Staphylococcus* sp in food is  
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

**SECTION B(5X6=30Marks) - Answer ALL Questions.**

11a) What is the significance of molds in food microbiology? Describe. (or)  
    b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)  
    b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)  
    b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)  
    b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION—C(5X12=60Marks)
Answer ALL Questions.

16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.

17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.

18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.

19a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.

20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs		Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. GAATTC is the recognition sequence of
   (a) BamHI (b) EcoRI (c) HindIII (d) HaeIII

2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase (b) E.coli ligase (c) Sal ligase (d) All

3. Phosphoramidite method is used for the synthesis of
   (a) DNA (b) Protein (c) Phosphatase (d) Phosphoric acid

4. Plasmids are DNA strands which are
   (a) Extrachromosomal (b) Double stranded (c) Self replicating (d) All the above

5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi.

7. Colony hybridization technique is employed for
   (a) Selection of vector (b) Unhybridised ones (c) Selection of desirable clones (d) None of the above

8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation (b) Microinjection (c) Transformation (d) None

9. Taq polymerase is isolated from
   (a) Thermophillus aquaticus (b) Thermus aquaticus (c) Thermobacter aquaticus (d) Thermus aquaticae

10. Hybridization technique used to detect protein in a gel is
   (a) Southern blot (b) Northern blot (c) Western blot (d) Eastern blot
SECTION-B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning.     Or
     (b) Explain the action of Methylases.
12. (a) Write a note on YAC.       Or
     (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis.       Or
     (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone?   Or
     (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique.        Or
     (b) Give an account on RAPD.

SECTION-C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses.     Or
     (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library.       Or
     (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.   Or
     (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
     (b) How will you identify the presence of r DNA in a cell?.
20. (a) Explain Southern blotting technique and its applications.    Or
     (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) ----------- are broad spectrum antiviral products
   a) Histones  b) IFN  c) Streptomycin  d) Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c) Xanthococcus  d) Zymomonas
3) ----------- is involved in the fusion of myloma cells with spleen cells
   a) PEG  b) PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as -----------
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) ----------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is -----------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c) Dinosaurs  d) Mice
8) Method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) Marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION B (5X5=25Marks) - Answer ALL Questions.

11a) Write a brief account on commercial biosynthesis of interferons
    b) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application and development of transgenic sheep
    b) Transgenic mice; DNA microinjection method of development - explain
14a) Explain in short about Ti based cointegrate vectors
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION C (5X8=40Marks) - Answer ALL Questions.

16a) Write an essay on the commercial synthesis of small proteins
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application
    b) Discuss about transgenic - goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in ____________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a________________
   a. open culture system    b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system
5. Streptomycin fermentation by S. griseus produces
   a. Vitamin B2 as a by product  b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at --------- stage of their growth.
   a. lag        b. log      c. stationary      d. decline
7. The term single –cell protein was coined at----------- in 1966
   a. CFTRI, Mysore   b. Massachusetts Institute of technology
   c. MTCC                                           d. Imperial chemical Industries.
8. ___________ was at one time the most important substrate for SCP production
   a. methanol  b. methane c. oil d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery  b. quality control c. sterilization d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid  b. amino acid c. both d. none

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. Discuss the significance of microbes in the production of commercially important products.
      (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture  (or)
      .b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production. (or)
      .b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making  (or)
      .b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods. (or)
      .b. Write short notes on batch filters that are employed in down streaming processing.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Give a detailed account on the various methods of strain improvement  (or)
      b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.  (or)
      b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.  (or)
      b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.  (or)
      b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.  (or)
      b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is a) Ammensalism b) Commensalism c) Parasitism d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism b) Commensalism c) Parasitism d) Symbiosis

3) ---------------- is an example of recalcitrant compound
   a) Lignin b) Protein c) Carbohydrate d) Lipid

4) Fermentation is an an example for ---------- degradation
   a) Aerobic b) Anaerobic c) a and b d) None of the above

5) ---------------- is a cellulolytic bacteria
   a) Pseudomonas b) Klebsiella c) Mycoplasma d) Zymomonas

6) Rhizobium exist as -------- in the nodules
   a) Protoplast b) Bacterioides c) Mycoplasma d) None of the above

7) Azospirillum is an example for
   a) Free living b) Symbiotic c) associative d) all the above

8) According to the American standard of potability ---------- number of E.coli can present in 100 ml of water a) 1 b) 0 c) 10 d) 100

9) Application of alum is in ------- phase of water treatment

10) Super Bug was developed and patented by ---------
    a) Khorana b) Kohnberg c) Chakraborthy d) Sanger

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

1. Who discovered the TMV?  (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) M. Theiler
2. The spikes are otherwise  (a) Peplomers (b) Capsid (c) Envelope (d) Coat
3. The one step growth experiment was developed by  
   (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is  (a) T4 phage  (b) MS2  (c) QB (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called  
   (a) Conduction  (b) Transfection (c) Insertion  (d) Induction
6. The int gene codes for the synthesis of an ------------ enzyme  
   (a) Integrase  (b) Ligase (c) Excisionase (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called  
   (a) Non – infectious ss RNA  (b) Infectious ss RNA
   (c) Non – infectious ss DNA  (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through  
   (a) Endodesmata  (b) Pore  (c) Echodesmata  (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on  
   (a) Plasma membrane  (b) Cytoplasm  (c) Nucleus  (d) None of the above
10. For measles, the immunogen is  
    (a) Active but attenuated  (b) Inactive but attenuated (c) Inactive heat killed  (d) Inactivated

SECTION – B (5×6=30Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or  
    (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or  
    (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or  
    (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or  
    (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or  
    (b) Give a brief outline on Rubella virus.

SECTION – C (5×12=60Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or  
    (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or  
    (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or  
    (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or  
    (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenecity and laboratory diagnosis of Hepatitis B virus. Or  
    (b) Explain the pathogenecity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs  Maximum – 75 Marks

SECTION A ( 10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease  a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called
   a. immuned  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
4. Toxigenecity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar  b. BSA  d. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces  b. urine  c. sputum  d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers.  (or)
     b. State Koch postulates.
12.a. Give the features of Streptococcus.  (or)
     b. Give the features of B.anthracs
13.a. Describe the methods for diagnosis to tetanus  (or)
     b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever.  (or)
     b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidiae.  (or)
     b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples.  (or)
     b. As a microbiologist how would you take up an investigation of epidemics? Add a note
        on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How
        would you diagnose the same?  (or)
     b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani.  (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli.  (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum.  (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha  
   b) Mycelium  
   c) Mould  
   d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci  
   b) P. notatum  
   c) Rhizopus  
   d) Mucor

3. Candidosis is caused mainly by ____________
   a) C. albicans  
   b) C. tropicalis  
   c) C. pseudotropicalis  
   d) C. krusei

4. The major organism which causes urinary tract infection is ______________
   a) E. coli  
   b) Salmonella  
   c) Shigella  
   d) Klebsiella

5. Traveller’s diarrhea is caused by ____________
   a) Enteropathogenic E. coli  
   b) Enterotoxigenic E. coli  
   c) Enteroinvasive E. coli  
   d) Enterotoxigenic E.coli

6. Blue pus is caused by ________  a) Pseudomonas  
   b) Vibrio  
   c) Salmonella  
   d) E. Coli

7. Sexually transmitted disease is caused by ____________
   a) Treponema  
   b) Klebsiella  
   c) Proteus  
   d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as ____________
   a) Septicemia  
   b) bacteremia  
   c) Viremia  
   d) Algemia

9. MIC denotes ______________
   a) Maximum inhibitory concentration  
   b) Minimum inhibitory concentration  
   c) Multiple inhibitory concentration  
   d) None of the above

10. Endoflagella is a characteristic nature present in ____________
    a) Spriochetes  
    b) Salmonella  
    c) Proteus  
    d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium  (or)  b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14.a) Describe briefly on pyogenic infections. (or)  b) Comment on Pseudomonas.

15.a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16.a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17.a) Describe Trichusis trichura  (or)
    b) Comment on Wucheraria bancrofti

18.a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19.a) Comment on meningitis  (or)  b) Describe pyrexia

20.a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuart's medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION B (5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections? (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method? (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
   b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
   b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
   b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
   b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
   b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample

2. All the following are acid fast except,
   a) *Mycobacterium*  b) *Actinomycetes*  c) *Nocardia*  d) *Staphylococci*

3. The common medium used for growing *M tuberculosis* is
   a) Blood agar b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics IMViC+++– respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Klebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*

5. Selective medium for *Staphylococci* is a) EMB agar b) BSA c) MSA d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm b) 24mm c) 28mm d) 30mm

7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies  d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None

10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)

   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)

   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)

   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)

   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)

   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)

   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)

   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)

   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)

   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe?

   Where can one obtain such information? In this information available for all pathogens. (OR)

   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of 
   a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify 
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size? 
   a,) Entamoeba histolytica  b) Entamoeba coil  c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by 
   a) Ingestion of embryonated eggs. b) Larvae penetrating through the skin
   b) c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION-B (5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION-C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dermatophytoposes. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium*. (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**
Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology / Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
The Foundation course shall comprise of two stages as follows:
   - Foundation Course A : General Awareness (I & II semesters)
   - Foundation Course B : Environmental Studies (III & IV semesters)

The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.

- From the printed material supplied by the University - 75%
- Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A:** Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

**Group B:** allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C:** application oriented subjects: 2 subjects – 4 papers
The application –oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D:** field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

   a) A candidate will be permitted to appear for the university examinations for any semester if
      i) He/she secures not less than 75% of attendance in the number of working days during the semester.
      ii) He/she earns a progress certificate from the head of the institution, of having satisfactorily completed the course of study prescribed in the subjects as required by these regulations, and
      iii) His/her conduct has been satisfactory.

      Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortfall in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

(ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

(iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an
      institution approved by/affiliated to the University or has been exempted from in the manner
      prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a
       certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the
   first attempt, within the minimum period prescribed for the course of study from the date of
   admission to the course and secures I or II class shall be eligible for ranking and such ranking
   will be confined to 10 % of the total number of candidates qualified in that particular branch of
   study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical
   shall be permitted to do so and such candidate shall join a college in the III year of the course
   and he/she will be permitted to appear for par III alone by granting exemption form appearing
   Part I, Part II and common allied subjects (if any), already passed by the candidate. And a
   candidate desirous to obtain an additional UG degree involving practical shall be permitted to
   do so and such candidate shall join a college in the II year of the course and he/she be permitted
   to appear for Part III alone by granting exemption form appearing for Part I, Part II and the
   common allied subjects. If any, already passed. Such candidates should obtain exemption from
   the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective
   courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each
   paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change
   for a minimum period of three years from the date of approval of the Regulations. The
   University may revise/amend/change the Regulations and Scheme of Examinations, if found
   necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will
   be permitted to take the Examinations under those Regulations for a period of four years i.e. up
to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the
Examination only under the Regulations in force at that time.
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* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_),Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour,Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria – General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III  
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER – IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High speed, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT -III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GRA CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA-replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References

SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - I

UNIT - I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT - II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT - III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lambda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT - IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT - V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application, -Microarray.

References
UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotios -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References
SEMESTER - VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT - I
Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT - II
Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT - III

UNIT - IV
Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT - V
Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastecoir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I

Early development of virology – general properties of viruses- cultivation of Viruses- virus purification and assays. The structure of viruses- virion size-
General structure properties- helical capsids, icosohedral capsid- nucleic acids-
Viral envelopes and enzymes- virus classification.

UNIT- II

Reproduction of DNA phages- ds DNA lytic phages- lytic cycle of T4 phage
The one step growth- adsorption to the host cell and penetration- synthesis of
Phage nucleic acids and protein assembly of phage particles- release of phage
particles. Example of ss DNA phage- OX 174- circle replication.

UNIT-III

Lysogeny- temperate bacteriophages- lambda phage- induction of lysogens-

UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of
Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A.B).
Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References
edition, Wiley and sons.

SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diphtheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydas, Rickettsiae.

References
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT- I

UNIT -II

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- *Staphylococcus* and *Pseudomonas*: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References


SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus and Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia.*
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT – I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References

SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology – Collection and transport of clinical specimens – Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology – detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology– Special consideration– Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3-Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination -Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert koch   b) Louis Pasteur   c) Antony Von Leewenhock   d) Both b & c

2) Immunity mediated by antibodies are called as _________________
   a) Humoral   b) Cell mediated   c) Active   c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) ___________ is used as a counter stain in spare staining
   a) Safranin   b) Methylene blue   c) Malachite green   d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP   b) TDT   c) D   d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um   b) 0.3 um   c) 0.4 um   d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms   b) Anaerobic organisms   c) Facultative anaerobic organisms   d) Microphilic organisms

8) _______________ is an example for selective media.
   a) Mac conkey agar   b) EMB agar   c) Both a & b   d) None of the above.

9) TVC refers to ____________
   a) Total viable count   b) Total viral count   c) Total viable colony   c) None of the above.

10) _______________ is an example for short term preservation of microbes.
    a) Agar slant   b) Agar slant   c) Mineral oil overlay   d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theroy of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discus the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY
Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain    (b) Genus    (c) Species    (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram    (b) Similarity matrix    (c) Dendrogram    (d) None of the above
3. Which of the following is a motile bacterium
   (a) Esherichia coli    (b) Klebsiella    (c) Bacillus subtilis    (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall    (b) Colonies have fried egg appearance    (c) Require sterols for growth
       (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast    (b) Plastid    (c)Thylakoid    (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens    (b) Halophiles    (c) Thermophiles    (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores    (b)Zygospores    (c) Basidiospores    (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores    (b)Zygospores    (c) Conidiospores    (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae    (b) Green algae    (c) Blue green algae    (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall    (b) Move by flagella/pseudopodia
        (c) Unicellular    (d) Some are pathogens
SECTION-B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples
14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach
   Or
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of Bergeys manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks
SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds
2. Polarly flagellated bacteria is known as --------------
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane  (b) Mitochondria
   (c) Polyphosphate granules  (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes  (b) A double membrane structure
   (c) Communication with cytoplasm  (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  (c) M13 Phage  (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport  (b) Facilitated diffusion  (c) Symport  (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells  (b) Prokaryotic cells  (c) Both a & b  (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles  (b) Extreme thermophiles  (c) Acidophiles  (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage  (b) Ether linkage  (c) B 1-4 linkage  (d) Ionic linkage

**SECTION–B (5X6=30Marks) - Answer ALL Questions.**
11. (a) Describe the capsule and slime layer of prokaryotic cell.  Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum.  Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis.  Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion.  Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria.  Or
    (b) What are methanogens? Exemplify the role with examples.

**SECTION–C (5X12=60Marks)
Answer ALL Questions.**
16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization.  Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast.  Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell.  Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles.  Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water (b) Pigments (c) Light (d)H2S

2. *Thiobacillus thiooxidans* is an example of-------
   (a)Chemoautotrophs (b)Heterotrophs (c)Photoautotrophs (d)Copiotrophs

3. The organisms which tolerate high pressure are called
   (a) Halotolerant (b) Barotolerant (c) Psychrophilic (d)Thermotolerant

4. Chemostat is associated with
   (a) Synchronous culture (b)Batch culture (c) Continous culture (d)Diauxic growth

5. All the following are intermediates of TCA cycle except
   (a) Citric acid (b) Fumaric acid (c) Lactic acid(d) ketoglutaric acid

6. The two enzymes ,transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP (b) ED (c) HMP (d)TCA cycle

7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound (b)Oxygen (c) Nitrogenous compound (d) Carbondioxide

8. Which of the following carries out mixed acid fermentation?
   (a) Saccharomyces cerevisiae (b)Chlorella sp (c) Klebsiella sp (d) Escherichia coli

9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water (b) Sunlight (c)H2S (d) O2

10. The carrier molecule in cell- wall biosynthesis is a----
    (a) Lipid (b) Carbohydrate (c)Protein (d) None of the above

SECTION-B (5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.

12. (a) What is synchronous growth?Explain any one method of obtaining synchronous growth. Or
    (b)Give an account on Diauxic growth.

13. (a) Giving suitable example , describe substrate level phosphorylation. Or
    (b) Describe ED pathway.

14. (a) describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.

15. (a)What is anoxygenic photosynthesis ? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION-C (5X12=60Marks) - AnswerALLQuestions.

16. (a) With neat diagram , describe the event of endospore formation in bacteria. Or
    (b) With suitable examples , classify bacteria based on their nutritional requirements.

17. (a) Discuss in detail the different phases of growth.. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or 
   (b) What is oxidative phosphorylation? Describe.

19. (a) Explain briefly the propionic acid fermentation. Or 
   (b) Explain the pathway of anaerobic respiration with CO2 as final electron acceptor.

20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or 
   (b) Describe the C3 pathway of CO2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of 
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.

2. Moist heat sterilization is achieved by 
   a. lyophilization  b. incineration  c. autoclave  d. oven.

3. Lyophilization is the 
   a. separation of proteins  b. sudden freezing and dehydration  c. enzyme reaction by oxidation  d. high pressure–segmentation.

4. The pH is defined as 
   a. logH⁺  b. log2H⁺  c. -logH⁺  d. -log2H⁺

5. Which is used as an absorbent in TLC. 
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel

6. SDS-PAGE is used to separate 
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.

7. UV light is significantly absorbed by 
   a. coloured solution  b. nucleic acid  c. proteins  d. enzymes.

8. NPK analysis is done using 
   a. electrophoresis  b. centrifugation  c. flame photo  d. chromatography.

9. The pH of the blood is 
   a. 6.3  b. 7.4  c. 7.0  d. 7.6

10. What is the normality of 5M NaOH solution?

SECTION B(5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or) 
   b. Explain the working of an incubator.

12.a. Explain the electrodes used in pH measurement. (or) 
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.

13.a. What is paper chromatography? (or) 
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)

b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”

(or)

b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge. (or)

b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)

b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)

b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)

b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology.

   with their applications (or)

b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in -------- to prove that the RNA also act as genetic material
   a) TMV b) Retrovirus c) Pox d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A b) B c) C d) Z

3) Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase b) helicase c) polymerase d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad b) Tautam &Lederberg c) Meselson &stahl d) Hershey & Chase

5) no of codons constitute the coding dictionary
   a) 64 b) 61 c) 62 d) 60
6) CAP is involved in--------?
   a) Catabolic repression  b) Induction c) feedback inhibition   d) None of these
7) -------is an example for intercalating agent?
   a) Acridine orange  b) EMS  c) Nitrous oxide  d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair d) all of the above
9) Davis-u-tube expt is used to prove the existence of--------?
   a) Transformation  b) conjugation  c) transduction d) recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B (5x6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA   OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment   OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code   OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test   OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction   OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material   OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?   OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli   OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?   OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene   OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  
   b) Robert Kock  
   c) Louis Pasteur  
   d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  
   b) Hematopoiesis  
   c) Hemoglobin  
   d) None of the above.

3) __________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  
   b) Haptens  
   c) Adjuvants  
   d) Epitopes

4) __________________ is the immunoglobulin which can cross the placenta.
   a) IgA  
   b) IgD  
   c) IgM  
   d) IgG

5) Type I hypersensitivity is otherwise called as ____________
   a) Cell Stimulating  
   b) Delayed type  
   c) Anaphylactic  
   d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator  
   b) Long acting thyroid stimulator  
   c) Lymph acting thyroid stimulator  
   d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin  
   b) Agglutinin  
   c) Agglutinogen  
   d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ______
   a) Ligand  
   b) Analyte  
   c) Both a & b  
   d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ____________
   a) Allografts  
   b) Autograft  
   c) Isograft  
   d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ____________
    a) Adoptive immunisation  
    b) Adaptive immunisation  
    c) Combined  
    d) None of the above.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins.

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) aminoacids

2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella

3. The high temperature short time (HTST) method of pasteurization employs a temperature time
   combination of
   (a) 62.8°C, 30 min (b) 62.5°C, 30 min (c) 71.7°C, 15 sec (d) 71.7°C, 15 min

4. Ropiness of bread is caused by species of
   (a) Aspergillus (b) Bacillus (c) Saccharomyces (d) Serratia

5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice

6. A can with a minute leak during storage is called a
   (a) breather (b) springer (c) flipper (d) sparger

7. The term leavening is associated with the preparation of
   (a) soy sauce (b) yoghurt (c) bread (d) cheese

8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides (b) Streptococcus faecalis (c) Pediococcus cerevisiae (d) Staphylococcus aureus

9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample (b) storage of sample at room temperature for 24 hr (c) gathering information (d) laboratory testing

10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

SECTION B (5×6=30 Marks) - Answer ALL Questions.

11a) What is the significance of molds in food microbiology? Describe. (or)
    b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.

12a) Discuss the drying process as a method of food preservation. (or)
    b) Explain the role of radiation in food preservation.

13a) What are the various rots of eggs produced by bacteria? Describe. (or)
    b) Describe the colour changes in milk due to the growth of spoilage microorganisms.

14a) Describe briefly the production of soy sauce. (or)
    b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION-C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.
19 a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI (b) EcoRI (c) HindIII (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase (b) E.coli ligase (c) Sal ligase (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA (b) Protein (c) Phosphatase (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosomal (b) Double stranded (c) Self replicating (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi.
7. Colony hybridization technique is employed for
   (a) Selection of vector (b) Unhybridised ones (c) Selection of desirable clones (d) None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation (b) Microinjection (c) Transformation (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus (b) Thermus aquaticus (c) Thermobacter aquaticus (d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
   (a) Southern blot (b) Northern blot (c) Western blot (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or
   (b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or
   (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or
   (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or
   (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or
   (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or
   (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
   (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
   (b) How will you identify the presence of r DNA in a cell?
20. (a) Explain Southern blotting technique and its applications. Or
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs
aximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) __________ are broad spectrum antiviral products
   a) Histones  b) IFN  c) Streptomycin  d) Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris c) Xanthococcus  d) Zymomonas
3) __________ is involved in the fusion of myloma cells with spleen cells
   a) PEG  b) PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as __________
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) __________ required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is __________
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c) Dinosaurs  d) Mice
8) ------------ method is involved development of transgenic animal
   a) Microinjection   b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) -------------- marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

**SECTION-B(5X5=25Marks) - Answer ALL Questions.**

11a) Write a brief account on commercial biosynthesis of interferons  (or)
   d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application and development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP  (or)
    b) What is Bioremediation? How does r DNA technology influences it?

**SECTION-C (5X8=40Marks) - Answer ALL Questions.**

16a) Write an essay on the commercial synthesis of small proteins  (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies  (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides  (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19) a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application  (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

**CORE PAPER IX – FERMENTATION TECHNOLOGY**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A (10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in ______________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a_______________
   a. open culture system   b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag   b. log   c. stationary   d. decline
7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore   b. Massachusetts Institute of technology
   c. MTCC   d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control   c. sterilization   d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid   c. both   d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**
11.a. Discuss the significance of microbes in the production of commercially important products.
     (or) b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture  (or)
     .b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.  (or)
     b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making  (or)
     b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.  (or)
     b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**
16.a. Give a detailed account on the various methods of strain improvement  (or)
     b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.  (or)
     b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.  (or)
     b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.  (or)
     b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.  (or)
     b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY
Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) ____________ is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an example for ____________ degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) ____________ is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as ____________ in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability ____________ number of E.coli can present in 100 ml of water
   a) 1  b)0  c)10  d) 100

9) Application of alum is in ____________ phase of water treatment

10) Super Bug was developed and patented by ____________
    a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?  (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) M. Theiler
2. The spikes are otherwise  (a) Peplomers  (b) Capsid  (c) Envelope  (d) Coat
3. The one step growth experiment was developed by  
   (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is  (a) T4 phage  (b) MS2  (c) QB  (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called  
   (a) Conduction  (b) Transfection  (c) Insertion  (d) Induction
6. The int gene codes for the synthesis of an --------enzyme  
   (a) Integrase  (b) Ligase  (c) Excisionase  (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called  
   (a) Non – infectious ss RNA  (b) Infectious ss RNA  
   (c) Non – infectious ss DNA  (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through  
   (a) Endodesmata  (b) Pore  (c) Echodesmata  (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on  
   (a) Plasma membrane  (b) Cytoplasm  (c) Nucleus  (d) None of the above
10. For measles, the immunogen is  
    (a) Active but attenuated  (b) Inactive but attenuated  (c) Inactive heat killed  (d) Inactivated

SECTION B (5X6 = 30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region.  Or  
    (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment.  Or  
    (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage.  Or  
    (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell.  Or  
    (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS.  Or  
    (b) Give a brief outline on Rubella virus.

SECTION C (5X12 = 60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods.  Or  
    (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage.  Or  
    (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny.  Or  
    (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses.  Or  
    (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus.  Or  
    (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs

Maximum – 75 Marks

SECTION A ( 10 × 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease
   a. Malaria   b. filariasis   c. plaque   d. all the above
2. Persons with symptomless infection is called
   a. immune    b. carrier    c. vector    d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
4. Toxigenecity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with
   a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar  b. BSA  c. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces  b. urine  c. sputum  d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers.  (or)
    b. State Koch postulates.
12.a. Give the features of Streptococcus.  (or)
    b. Give the features of B.anthracis
13.a. Describe the methods for diagnosis to tetanus  (or)
    b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever.  (or)
    b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidia.  (or)
    b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples.  (or)
    b. As a microbiologist how would you take up an investigation of epidemics? Add a note
       on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How
       would you diagnose the same?  (or)
    b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani.  (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli.  (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum.  (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha      b) Mycelium     c) Mould      d) Fungi
2. _________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci   b) P. notatum    c) Rhizopus    d) Mucor
3. Candidosis is caused mainly by ________________
   a) C. albicans   b) C. tropicalis   c) C. pseudotropicalis  d) C. krusei
4. The major organism which causes urinary tract infection is ________________
   a) E. coli     b) Salmonella    c) Shigella     d) Klebsiella
5. Traveller's diarrhea is caused by ________________
   a) Enteropathogenic E. coli   b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli    d) Enterotoxigenic E.coli
6. Blue pus is caused by _______ a) Pseudomonas b) Vibrio     c) Salmonella d) E. Coli
7. Sexually transmitted disease is caused by ________________
   a) Treponema  b) Klebsiella  c) Proteus    d) Pseudomonas
8. Invasion of microorganisms into the bloodstream is called as______________
   a) Septicemia   b) bacteremia  c) Viremia    d) Algemia
9. MIC denotes ________________
   a) Maximum inhibitory concentration   b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration  d) None of the above
10. Endoflagella is a characteristic nature present in ________________
    a) Spriochetes b) Salmonella  c) Proteus    d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. a) Comment on superficial infection. (or) b) Describe candidiasis
12. a) Comment on Taenia solium   (or) b) Give a brief note on Ascaris.
13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
     b) Describe respiratory tract infections.
14.a) Describe briefly on pyogenic infections. (or) b) Comment on Pseudomonas.
15.a) Explain the mechanism of drug resistance (or)
     b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.
16.a) Add a note on opportunistic fungal infections (or)
     b) Aspergillosis Describe.
17.a) Describe *Trichus trichura* (or)
     b) Comment on Wucheraria bancrofti
18.a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
     b) Comment on pyogenic infections caused by *Staphylococcus*.
19. a) Comment on meningitis (or)  b) Describe pyrexia
20.a) Describe drug resistance nature of bacteria
     b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium  
   b) Glycerol saline medium  
   c) Cary Blair medium  
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne  
   b) Ingestion  
   c) Direct inoculation  
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True  
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid  
   b) Blood  
   c) Semen  
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol  
   b) Sputolysin  
   c) Sputasol  
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol  
   b) Sodium hypochlorite  
   c) 2% Glutaraldehyde  
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium  
   b) Cooked meat medium  
   c) Saponin broth  
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) DOT – ELISA  
   b) ELISA  
   c) Western blot  
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
   a) Culturing on LJ medium  
   b) Acid fast staining  
   c) Animal susceptibility  
   d) Fluorescent Microscopy.

SECTION B (5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else?  (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections.  (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed?  (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory.  (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method.  (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
   b) Describe the procedures used for culturing anaerobic microorganisms.
17. a) Classify infectious biological agents on the basis of hazards. (OR)
   b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.
18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
   b) How can individual pathogenic viruses be identified in the lab.
19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
   b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.
20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
   b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine. c) Urine form catheter bag. d) Early morning urine sample
2. All the following are acid fast except,
   a) *Mycobacterium*   b) *Actinomycetes*   c) *Nocardia*   d) *Staphylococci*
3. The common medium used for growing *M tuberculosis* is
   a) Blood agar. b) Mac conkey agar. c) Lowenstein Jensen’s medium. d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*   b) *Kiebsiella pneumoniae*   c) *Proteus vulgaris*   d) *Pseudomonas aeruginosa*
5. Selective medium for *Staphylococci* is a) EMB agar. b) BSA. c) MSA. d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm. b) 24mm. c) 28mm. d) 30mm
7. VDRL is an example for
   a) Agglutination. b) Precipitation. c) Complement fixation test. d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh (D) - negative. b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies. d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen. b) Antibody. c) Antigen and Antibody. d) None
10. Blotting of DNA is called
    a) Western blot. b) Southern blot. c) Northern blot. d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe?
   Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Growth medium for fungus inhibits growth of
   a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica  b) Entamoeba coil  c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs.  b) Larvae penetrating through the skin
   b)  c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why?  (OR)
   b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces.  (OR)
   b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics?  (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly.  (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture.  (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dermatophytoses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — Plasmodium. (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis? (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology / Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      The Foundation course shall comprise of two stages as follows:
      - Foundation Course A : General Awareness (I & II semesters)
      - Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      - From the printed material supplied by the University - 75%
      - Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d)  Part – III

**Group A**: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e)  Co-Curricular activities: NSS/NCC/Physical education
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

   a) A candidate will be permitted to appear for the university examinations for any semester if

   i) He/she secures not less than 75% of attendance in the number of working days during the semester.

   ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and

   iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) "Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree."
6. **Medium of Instruction and examinations**
   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**
   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**
   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**
   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**
   a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

   b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

   (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

   (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**

   No candidate shall be eligible for conferment of the Degree unless he / she,
   
i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**

   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10 % of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   
The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**

   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for Part III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**

   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**

   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**

   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**

   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
### SCHEME OF EXAMINATIONS

<table>
<thead>
<tr>
<th>Sem</th>
<th>Part</th>
<th>Subject and Paper</th>
<th>Instruction Hrs per week</th>
<th>University Examinations Duration in Hrs</th>
<th>Max Marks</th>
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*NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram”s, Spore, AFB_),Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour,Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria-General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCL-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I
Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II

UNIT - III

UNIT- IV
Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V
Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High speed, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT - III


UNIT – IV


UNIT – V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al/ Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA– replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER – V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria,mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture , oxidation – reduction potential , nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT - III

Spoilage of food - cereals , vegetables ,fruits , egg and milk – canned foods .

UNIT - IV


UNIT - V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER – V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, -RAPD and Application,-Microarray.

References
SEMESTER -V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application , Bioremediation.

References
SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development-
Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration,
Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes- coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER - VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V


References
UNIT - I
Infections- sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of
epidemics.

UNIT - II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
\textit{Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis,}
\textit{Corynebacterium diphtheriae}.

UNIT - III
Morphology, pathogenicity and laboratory diagnosis- Gram positive
Organisms- \textit{Clostridium perfringens, Clostridium tetani}.

UNIT - IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative
organisms \textit{Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella,}
\textit{Pseudomonas, Vibrio cholerae}.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- \textit{Mycobacterium}
\textit{Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira,}
\textit{Chlamydia, Rickettsiae}.

References

1. Mackie and Mc catney, 1994, Medical Microbiology No I and II. Churchill
   Livingstone, 14th edition.
   Longman.
   Calcutta.
   Mosby Publications.
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange
   Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II

MEDICAL MICROBIOLOGY - II

UNIT- I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References
SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli*, *Klebsiella pneumoniae*, *Proteus*, *Salmonella*, *Shigella*, *Pseudomonas*, *Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans*, *Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus*, *Mucor*, *Penicillium*, *Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba*, *Plasmodium*, *Ascaris*, *Taenia*.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT –IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectorophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert koch   b) Louis Pasteur   c) Antony Von Leewenhock   d) Both b & c

2) Immunity mediated by antibodies are called as _________________
   a) Humoral   b) Cell mediated   c) Active   c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) ___________ is used as a counter stain in spare staining
   a) Safranin   b) Methylene blue   c) Malachite green   d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP   b) TDT   c) D   d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um   b) 0.3 um   c) 0.4 um   d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms   b) Anaerobic organisms   c) Facultative anaerobic organisms   d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar   b) EMB agar   c) Both a & b   d) None of the above.

9) TVC refers to ________________
   a) Total viable count   b) Total viral count   c) Total viable colony   c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant   b) Agar slant   c) Mineral oil overlay   d) a,b & c.

SECTION–B (5X6 = 30 Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - AnswerALLQuestions.

16) a) Describe spontaneous generation theory. (or)
    b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
    b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
    b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
    b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
    b) Describe the types of long term preservation of cultures.

CORE PAPER II -MICROBIAL DIVERSITY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram (b) Similarity matrix (c) Dendrogram (d) None of the above
3. Which of the following is a motile bacterium
   (a) Escherichia coli (b) Klebsiella (c) Bacillus subtilis (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall (b) Colonies have fried egg appearance (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast (b) Plastid (c)Thylakoid (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens (b) Halophiles (c) Thermophiles (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores (b)Zygospores (c) Basidiospores (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores (b) Zygospores (c) Conidiospores (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae (b) Green algae (c) Blue green algae (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall (b) Move by flagella/pseudopodia
    (c) Unicellular (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? Explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.
14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium.
15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of Bergeys manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples.
19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Chlorophyta and phaeophyta. Or
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide + compounds (d) other compounds
2. Polarly flagellated bacteria is known as
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B-1-4 linkage (d) Ionic linkage

SECTION – B(5X6=30Marks) - Answer ALL Questions.
11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION – C(5X12=60Marks)
Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                                             Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water                (b) Pigments           (c) Light          (d) H2S
2. *Thiobacillus thiooxidans* is an example of----------
   (a) Chemoautotrophs     (b) Heterotrophs      (c) Photoautotrophs (d) Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant        (b) Barotolerant      (c) Psychrophilic     (d) Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture (b) Batch culture      (c) Continuous culture  (d) Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid         (b) Fumaric acid      (c) Lactic acidInsertion  (d) Kglutaric acid
6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP     (b) ED     (c) HMP     (d) TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound    (b) Oxygen              (c) Nitrogenous compound  (d) Carbon dioxide
8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae* (b) *Chlorella sp* (c) Klebsiella sp (d) Escherichia coli
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water            (b) Sunlight            (c) H2S              (d) O2
10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid           (b) Carbohydrate       (c) Protein          (d) None of the above

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.
13. (a) Giving suitable example, describe substrate level phosphorylation. Or
    (b) Describe ED pathway.
14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a) What is anoxygenic photosynthesis? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria. Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
   (b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
   (b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
   (b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization b. moist air sterilization c. membrane filtr d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization b. incineration c. autoclave d. oven.
3. Lyophilization is the
   a. separation of proteins b. sudden freezing and dehydration c. enzyme reaction by oxidation d. high pressure–segmentation.
4. The pH is defined as
   a. logH⁺ b. log2H⁺ c. -logH⁺ d. -log2H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution b. lead sulphate c. anions d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid b. lipid c. protein d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solution b. nucleic acid c. proteins d. enzymes.
8. NPK analysis is done using
   a. electrophoresis b. centrifugation c. flame photo d. chromatography.
9. The pH of the blood is
   a. 6.3 b. 7.4 c. 7.0 d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION B (5X6=30 Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
     b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
     b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
     b. Describe the procedure for separation of proteins by SDS-PAGE.
14. a. Write down the principle and applications of Flame photometry. (or)
   b. Write a note on NPK analysis.

15. a) The specific volume of solid ammonium sulphate is 0.565ml/g. the solubility of
   ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 %
   saturated” solution to bring it to “60% saturation.”
   (or)
   b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a. Discuss the principle, types and applications of centrifuge. (or)
   b. Describe the instruments used for wet and dry sterilization.

17. a. Describe the different types of biosensors and their applications. (or)
   b. What is lyophilization? How is it done in the laboratory? What are its applications?

18. a. Explain Ion exchange chromatography. (or)
   b. Discuss the principle and methodology of affinity chromatography.

19. a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-
   Visible spectrophotometer over a special colorimeter? (or)
   b. Discuss the principle and applications of turbidometry.

20. a. What is a buffer solution? State the common buffer compounds used in biology.
   with their applications (or)
   b. Explain about the concentrations based on volume - molarity and normality. Also explain
   how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs          Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------- to prove that the RNA also act as genetic
   material
   a) TMV       b) Retrovirus    c) Pox       d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A         b) B           c) C         d) Z

3) Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase    b) helicase     c) polymerase  d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg  c) Meselson &stahl  d) Hershey & Chase

5) no of codons constitute the coding dictionary
   a) 64       b) 61         c) 62       d) 60
6) CAP is involved in--------?
   a) Catabolic repression  b) Induction c) feed back inhibition       d) None of these
7) ---------is an example for intercalating agent?
   a) Acridine orange  b) EMS   c) Nitrous oxide       d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair  d) all of the above
9) Davis-u-tube expt is used to prove the existance of--------?
   a) Transformation  b) conjugation   c) transduction d) recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger   c) Grick d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment     OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material    OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?       OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage? OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) ____________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ______________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ______________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as ______________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ____________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ____________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or) 
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or) 
   b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY
Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti  (b) pyruvic acid  (c) fumaric acid  (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia  (b) Flavobacterium  (c) Micrococcus  (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time
   combination of
   (a) 62.8°C, 30 min  (b) 62.5°C, 30 min  (c) 71.7°C, 15 sec  (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus  (b) Bacillus  (c) Saccharomyces  (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer  (b) sauerkraut  (c) soft drinks  (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather  (b) springer  (c) flipper  (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce  (b) yoghurt  (c) bread  (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides  (b) Streptococcus faecalis
   (c) Pediococcus cerevisiae  (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample  (b) storage of sample at room temperature for 24 hr
   (c) gathering information  (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin  (b) a neurotoxin  (c) a hepatotoxin  (d) a nephrotoxin.

SECTION B (5X6=30 Marks) - Answer ALL Questions.

11a) What is the significance of molds in food microbiology? Describe.  (or)
    b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful
       effects.
12a) Discuss the drying process as a method of food preservation.  (or)
    b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe.  (or)
    b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce.  (or)
    b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria.  (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.

16a) Discuss the importance of bacteria in food microbiology with suitable examples  (or)
b) What are the various factors that influence the growth of microorganisms in foods.

17a) Discuss the use of high temperature in food preservation.  (or)
b) Discuss the principles of food preservation.

18a) Write in detail about any six types of organism responsible for spoilage of vegetables  (or)
b) Discuss the biological spoilage of canned foods.

19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects.  (or)
b) With neat flow chart describe the production of cheese.

20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs  Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. GAATTC is the recognition sequence of  
(a) BamHl  (b) EcoRI  (c) HindIII  (d) HaeIII

2. An example of a ligase capable of both blunt and cohesive end ligation is  
(a) T4 ligase  (b) E.coli ligase  (c) Sal ligase  (d) All

3. Phosphoramidite method is used for the synthesis of  
(a) DNA  (b) Protein  (c) Phosphatase  (d) Phosphoric acid

4. Plasmids are DNA strands which are  
(a) Extrachromosomal  (b) Double stranded  (c) Self replicating  (d) All the above

5. Insertional vectors are derived from  
(a) Bacterial plasmid  (b) Phage lambda  (c)M13 Phage  (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of  
(a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi.

7. Colony hybridization technique is employed for  
(a)Selection of vector  (b)Unhybridised ones  (c)Selection of desirable clones  (d) None of the above

8. The introduction of DNA into a single eukaryotic cell with a fine needle  
(a) Electroporation  (b) Microinjection  
(c) Transformation  (d) None

9. Taq polymerase is isolated from  
(a) Thermophilus aquaticus  (b) Thermus aquaticus  
(c) Thermobacter aquaticus(d) Thermus aquaticae

10. Hybridization technique used to detect protein in a gel is  
(a) Southern blot  (b) Northern blot  (c) Western blot  (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. (a) Define cloning. Explain the various steps involved in cloning. Or
   (b) Explain the action of Methylases.

12. (a) Write a note on YAC. Or
   (b) Explain a typical cosmid vector.

13. (a) Give an account on cDNA synthesis. Or
   (b) How will you purify plasmid DNA?

14. (a) How alpha complementation of lac Z helps one to identify clone? Or
   (b) How will you identify a recombinant DNA by immunological assay?

15. (a) Explain Northern blotting technique. Or
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16. (a) Define restriction enzyme and add a note on classification and its uses. Or
   (b) Give a brief account on ligases.

17. (a) Explain the construction of cDNA and DNA library. Or
   (b) Explain the chemical synthesis of DNA in laboratory.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
   (b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Give a detailed account on gene transfer techniques. Or
   (b) How will you identify the presence of rDNA in a cell?

20. (a) Explain Southern blotting technique and its applications. Or
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs  
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) ---------- are broad spectrum antiviral products
   a) Histones    b) IFN    c) Streptomycin    d) Nystatin

2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c) Xanthococcus  d) Zymomonas

3) ---------- is involved in the fusion of myeloma cells with spleen cells
   a) PEG    b) PGA    c) IPTG    d) EtBr

4) Vaccines that require a carrier molecule for its activity is called as ----------
   a) Subunit    b) Whole cell    c) Antiidiotype    d) Peptide

5) ---------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes    b) Right border    c) Left border    d) IAA

6) Nopaline is ----------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme

7) Example of an animal model involved in transgenesis
   a) Monkey    b) Snake    c) Dinosaurs    d) Mice
8) ________ method is involved development of transgenic animal
   a) Microinjection   b) Protoplast fusion   c) Hybridoma technology   d) b and c
9) __________ marker are involved in DNA Fingerprinting
   a) VNTR   b) RFLP   c) RAPD   d) STR3
10) Father of HGP
   a) Francis Collins   b) Venter   c) James Watson   d) Hunkapillar

SECTION – B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
    b) List the us Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotyype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application ad development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19) a) Discuss methodologies involved in the creation of transgenic mice also add
     brief note on its application (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a deailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening   b. strain improvement   c. pilot scale   d. commercial operation
2. Glutamic acid is used for
   a. feed supplement   b. flavour enhancer   c. ethanol production   d. antibiotic fermentation
3. Steady state is achieved in __________ fermentation.
   a. batch   b. fed-batch   c. continuous   d. all
4. Batch culture is a__________________________
   a. open culture system  b. system that maintains constant cell conc.
   c. system with addition of nutrients  d. closed culture system
5. Streptomycin fermentation by S. griseus produces
   a. Vitamin B2 as a by product  b. Vitamin B12 as a by product
   c. Vitamin C as a by product  d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag    b. log  c. stationary  d. decline
7. The term single –cell protein was coined at-------- in 1966
   a. CFTRI, Mysore  b. Massachusetts Institute of technology
   c. MTCC  d. Imperial chemical Industries.
8. ___________ was at one time the most important substrate for SCP production
   a. methanol  b. methane  c. oil  d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery  b. quality control  c. sterilization  d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid  b. amino acid  c. both  d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**

11.a. Discuss the significance of microbes in the production of commercially important products.
    (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture  (or)
    .b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.  (or)
    b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making  (or)
    b. Write about single cell protein.
15.a. Discuss the methods disruption of cells by physical methods.  (or)
    b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**

16.a. Give a detailed account on the various methods of strain improvement  (or)
    b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.  (or)
    b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.  (or)
    b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.  (or)
    b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.  (or)
    b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3)  is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an example for degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5)  is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospiillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability number of E.coli
   can present in 100 ml of water
   a) 1  b) 0  c) 10  d) 100

9) Application of alum is in phase of water treatment

10) Super Bug was developed and patented by
    a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION – B (5X6 = 30 Marks) - Answer ALL Questions.

11a) Discuss in brief about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION – C (5X12 = 60 Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV? (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) M. Theiler
2. The spikes are otherwise (a) Peplomers (b) Capsid (c) Envelope (d) Coat
3. The one step growth experiment was developed by (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is (a) T4 phage (b) MS2 (c) QB (d) OX 174
5. The process of release of the prophage from the bacterial DNA is called (a) Conduction (b) Transfection (c) Insertion (d) Induction
6. The int gene codes for the synthesis of an enzyme (a) Integrase (b) Ligase (c) Excisionase (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA (b) Infectious ss RNA (c) Non – infectious ss DNA (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through (a) Endodesmata (b) Pore (c) Echodesmata (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane (b) Cytoplasm (c) Nucleus (d) None of the above
10. For measles, the immunogen is (a) Active but attenuated (b) Inactive but attenuated (c) Inactive heat killed (d) Inactivated

SECTION – B (5X6 = 30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or (b) Give a brief outline on Rubella virus.

SECTION – C (5X12 = 60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)

1. An example of zoonotic disease a. Malaria b. filariasis c. plaque d. all the above
2. Persons with symptomless infection is called a. immune b. carrier c. vector d. resistant
3. The commonest cause of localized suppurative lesion in man is a. streptococci b. staphylococci c. Pseudomonas d. Vibrio
5. Spot the Gram positive anaerobic endospore forming bacillus a. Lactobacillus b. Corynebacterium c. Clostridium d. Mycobacterium
6. Clostridium tetani is the causative agent of a. anthrax disease b. lock jaw c. hepatitis d. rabies
7. Food borne intoxication is caused by a. Salmonella b. E.coli c. Shigell d. Staphylococcus
8. Darting motility is seen with a. E.coli b. Streptococcus c. V.cholerae d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae a. SS agar b. BSA c. LJ d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is a. faeces b. urine c. sputum d. blood

SECTION – B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers. (or)
   b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)
   b. Give the features of B.anthracis
13.a. Describe the methods for diagnosis to tetanus (or)
   b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)
   b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidiae. (or)
   b. Give the features of Rickettsiae.

SECTION – C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples. (or)
   b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
   b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
   b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
   b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
   b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II
Duration – 3hrs Maximum – 75 Marks
SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A tangled mass of hyphae is called as ________________
   a) Hypha       b) Mycelium       c) Mould       d) Fungi
2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci    b) P. notatum    c) Rhizopus    d) Mucor
3. Candidos is caused mainly by _________________.
   a) C. albicans   b) C. tropicalis  c) C. pseudotropicalis d) C. krusei
4. The major organism which causes urinary tract infection is ________________
   a) E. coli       b) Salmonella     c) Shigella   d) Klebsiella
5. Traveller's diarrhea is caused by _________________.
   a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli    d) Enterotoxigenic E. coli
6. Blue pus is caused by _______ a) Pseudomonas b) Vibrio    c) Salmonella d) E. Coli
7. Sexually transmitted disease is caused by _________________.
   a) Treponema b) Klebsiella c) Proteus   d) Pseudomonas
8. Invasion of microorganisms into the bloodstream is called as _________________.
   a) Septicemia b) bacteraemia c) Viremia d) Algemia
9. MIC denotes _________________.
   a) Maximum inhibitory concentration b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration d) None of the above
10. Endoflagella is a characteristic nature present in _________________.
    a) Spirochetes b) Salmonella c) Proteus d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. a) Comment on superficial infection. (or)
    b) Describe candidiasis
12. a) Comment on Taenia solium     (or) b) Give a brief note on Ascaris.
13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.
14.a) Describe briefly on pyogenic infections. (or) b) Comment on Pseudomonas.
15.a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.
16.a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.
17.a) Describe Trichus trichura (or)
    b) Comment on Wucheraria bancrofti
18.a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.
19.a) Comment on meningitis (or) b) Describe pyrexia
20.a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections? (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method? (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A ( 10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample

2. All the following are acid fast except,
   a) *Mycobacterium* b) *Actinomycetes* c) *Nocardia* d) *Staphylococci*

3. The common medium used for growing *M tuberculosis* is
   a) Blood agar b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium

4. An isolate from a urine specimen shows the following biochemical characteristics IMViC+++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli* b) *Klebsiella pneumoniae* c) *Proteus vulgaris* d) *Pseudomonas aeruginosa*

5. Selective medium for *Staphylococci* is
   a) EMB agar b) BSA c) MSA d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm b)24mm c)28mm d) 30mm

7. VDRL is an example for
   a) Agglutination b) Precipitation c) Complement fixation test d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (D) - negative b) are “universal recipients” of transfusion c) have circulating anti A and B antibodies d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen b) Antibody c) Antigen and Antibody d) None

10. Blotting of DNA is called
    a) Western blot b) Southern blot c) Northern blot d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe?
    Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
6. Hookworm infection is by
   a) Ingestion of embryonated eggs  b) Larvae penetrating through the skin
   c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION B (5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics? (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dermatophytoses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoa — *Plasmodium*. (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY with Semester System (with effect from 2007-2008)

1. Eligibility for Admission to the Course
   Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. Duration of the Course
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. Course of Study
   The course of study for the UG degree courses of all branches shall consist of the following
   a) Part - I
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.
   b) Part – II : English
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.
   c) Foundation Course
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A:** Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester.

**Group B:** allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C:** application oriented subjects: 2 subjects – 4 papers
The application –oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D:** field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

- A-Exemplary
- B-very good
- C-good
- D-fair
- E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

   a) A candidate will be permitted to appear for the university examinations for any semester if

      i) He/she secures not less than 75% of attendance in the number of working days during the semester.

      ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and

      iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

b) i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

   (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

   (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**

   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an
      institution approved by/affiliated to the University or has been exempted from in the manner
      prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a
       certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**

   A candidate who qualifies for the UG degree course passing all the examinations in the
   first attempt, within the minimum period prescribed for the course of study from the date of
   admission to the course and secures I or II class shall be eligible for ranking and such ranking
   will be confined to 10 % of the total number of candidates qualified in that particular branch of
   study, subject to a maximum of 10 ranks.
   
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**

   Any candidate who wishes to obtain an additional UG degree not involving any practical
   shall be permitted to do so and such candidate shall join a college in the III year of the course
   and he/she will be permitted to appear for par III alone by granting exemption form appearing
   Part I, Part II and common allied subjects (if any), already passed by the candidate. And a
   candidate desirous to obtain an additional UG degree involving practical shall be permitted to
   do so and such candidate shall join a college in the II year of the course and he/she be permitted
   to appear for Part III alone by granting exemption form appearing for Part I, Part II and the
   common allied subjects. If any, already passed. Such candidates should obtain exemption from
   the university by paying a fee of Rs.500/-.

14. **Evening College**

   The above regulations shall be applicable for candidates undergoing the respective
   courses in Evening Colleges also.

15. **Syllabus**

   The syllabus for various subjects shall be clearly demarcated into five viable units in each
   paper/subject.

16. **Revision of Regulations and Curriculum**

   The above Regulation and Scheme of Examinations will be in vogue without any change
   for a minimum period of three years from the date of approval of the Regulations. The
   University may revise /amend/ change the Regulations and Scheme of Examinations, if found
   necessary.

17. **Transitory Provision**

   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will
   be permitted to take the Examinations under those Regulations for a period of four years i.e. up
   to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the
   Examination only under the Regulations in force at that time.
## SCHEME OF EXAMINATIONS

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*NOTE* – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI.
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique—Wright’s tube, Roll tube, McIntost fieldes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GRA CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount – LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – Mcintosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT -III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA– replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping , genetic recombination.

References
2. Freifelder , S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT- IV

Fermented food – pickled cucumber, saurkraut, soysauce, Bread, Idli – Fermented dairy products – Yoghurt and cheese.

UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - I

UNIT -I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT - V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application.-Microarray.

References


SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT -IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I

Early development of virology – general properties of viruses- cultivation of Viruses- virus purification and assays. The structure of viruses- virion size-
General structure properties- helical capsids, icosohedral capsid- nucleic acids-
Viral envelopes and enzymes- virus classification.

UNIT- II

Reproduction of DNA phages- ds DNA lytic phages- lytic cycle of T4 phage
The one step growth- adsorption to the host cell and penetration- synthesis of Phage nucleic acids and protein assembly of phage particles- release of phage particles. Example of ss DNA phage- OX 174- circle replication.

UNIT-III

Lysogeny- temperate bacteriophages- lambda phage- induction of lysogens-

UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagonosis of Hepatitis (A.B).
Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References


SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of
epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diptheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive
Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative
organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella,
Pseudomonas, Vibrio cholerae.

UNIT -V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium
Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira,
Chlamydias, Rickettsiae.

References
1. Mackie and Mc catney, 1994, Medical Microbiology No I and II. Churchill Livingstone,
14th edition.
Longman.
Calcutta.
Mosby Publications.
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange
Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT- I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References
SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus and Streptococcus pyogenes.*
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia.*
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY
DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT – I
Diagnostic microbiology – Purpose and philosophy. Purpose of diagnostic microbiology –

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to
microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology,
Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV
Laboratory organization and quality assurance – specimen procurement and identification –
laboratory requisition form – reporting results – procedure manual – Quality assurance and
statistics.

UNIT – V
Management of clinical Microbiology laboratory – general approaches – rapid detection –
speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough
(ELBS) Tropical health technology butter worth’s, 1985.

medical publications USA.

SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectorrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3-Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunoelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
 MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs                                                        Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1) Who is called as "Father of Microbiology"?
   a) Robert koch   b) Louis Pasteur   c) Antony Von Leewenhock   d) Both b & c
2) Immunity mediated by antibodies are called as _________________
   a) Humoral   b) Cell mediated   c) Active   c) Passive
3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.
4) ___________ is used as a counter stain in spare staining
   a) Safranin   b) Methylene blue   c) Malachite green   d) Crystal violet
5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP   b) TDT   c) D   d) None of the above.
6) HEPA filters can remove particles of size ________________
   a) 0.2 um   b) 0.3 um   c) 0.4 um   d) 0.5 um
7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms   b) Anaerobic organisms
   c) Facultative anaerobic organisms   d) Microphilic organisms
8) _____________ is an example for selective media.
   a) Mac conkey agar   b) EMB agar   c) Both a & b   d) None of the above.
9) TVC refers to __________
   a) Total viable count   b) Total viral count   c) Total viable colony   c) None of the above.
10) ________________ is an example for short term preservation of microbes.
    a) Agar slant   b) Agar slant   c) Mineral oil overlay   d) a,b & c.

SECTION – B (5X6=30Marks) - Answer ALL Questions.
11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.
12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.
13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.
14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.
15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - AnswerALLQuestions.

16) a) Describe spontaneous generation theory.  (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope  (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail.  (or)
   b) Describe filtration and its types.
19) a) Discus the types of media with eg. for each.  (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer  (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II -MICROBIAL DIVERSITY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain  (b) Genus  (c) Species  (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram  (b) Similarity matrix  (c) Dendrogram  (d) None of the above
3. Which of the following is a motile bacterium
   (a) Esherichia coli  (b) Klebsiella  (c) Bacillus subtilis  (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall  (b) Colonies have fried egg appearance  (c) Require sterols for growth  
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast  (b) Plastid  (c)Thylakoid  (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens  (b) Halophiles  (c) Thermophiles  (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores  (b)Zygospores  (c) Basidiospores  (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores  (b) Zygospores  (c) Conidiospores  (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae  (b) Green algae  (c) Blue green algae  (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall  (b) Move by flagella/pseudopodia
    (c) Unicellular  (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.
14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of Bergeys manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples.
19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds
2. Polarely flagellated bacteria is known as ----------
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occurs in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION – C(5X12=60Marks)
Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water     (b) Pigments     (c) Light     (d) H2S

2. *Thiobacillus thiooxidans* is an example of----------
   (a) Chemoautotrophs     (b) Heterotrophs     (c) Photoautotrophs     (d) Copiotrophs

3. The organisms which tolerate high pressure are called
   (a) Halotolerant     (b) Barotolerant     (c) Psychrophilic     (d) Thermotolerant

4. Chemostat is associated with
   (a) Synchronous culture     (b) Batch culture     (c) Continous culture     (d) Diauxic growth

5. All the following are intermediates of TCA cycle except
   (a) Citric acid     (b) Fumaric acid     (c) Lactic acid     (d) Ketoglutaric acid

6. The two enzymes ,transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP     (b) ED     (c) HMP     (d) TCA cycle

7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound     (b) Oxygen     (c) Nitrogenous compound     (d) Carbondioxide

8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*     (b) *Chlorella sp*     (c) *Klebsiella sp*     (d) *Escherichia coli*

9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water     (b) Sunlight     (c) H2S     (d) O2

10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid     (b) Carbohydrate     (c) Protein     (d) None of the above

SECTION –B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.

12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.

13. (a) Giving suitable example , describe substrate level phosphorylation. Or
    (b) Describe ED pathway.

14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.

15. (a) What is anoxygenic photosynthesis? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram , describe the event of endospore formation in bacteria. Or
    (b) With suitable examples , classify bacteria based on their nutritional requirements.

17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or (b) What is oxidative phosphorylation? Describe.

19. (a) Explain briefly the propionic acid fermentation. Or (b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.

20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or (b) Describe the C3 pathway of Co2 fixation.

**CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A (10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization b. moist air sterilization c. membrane filtr d. chemical sterilization.

2. Moist heat sterilization is achieved by
   a. lyophilization b. incineration c. autoclave d. oven.

3. Lyophilization is the
   a. separation of proteins b. sudden freezing and dehydration c. enzyme reaction by oxidation d. high pressure–segmentation.

4. The pH is defined as
   a. logH⁺ b. log2H⁺ c. -logH⁺ d. -log2H⁺

5. Which is used as an absorbent in TLC.
   a. KCl solution b. lead sulphate c. anions d. silica gel

6. SDS-PAGE is used to separate
   a. nucleic acid b. lipid c. protein d. carbohydrate.

7. UV light is significantly absorbed by
   a. coloured solutio b. nucleic acid c. proteins d. enzymes.

8. NPK analysis is done using
   a. electrophoresi b. centrifugation. c. flame photo d. chromatography.

9. The pH of the blood is
   a. 6.3 b. 7.4 c. 7.0 d. 7.6

10. What is the normality of 5M NaOH solution?

**SECTION-B(5X6=30Marks) - Answer ALL Questions.**

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
   b. Explain the working of an incubator.

12.a. Explain the electrodes used in pH measurement. (or)
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.

13.a. What is paper chromatography? (or)
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry.  
   b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)

   b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge.  (or)
   b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications.  (or)
   b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography.  (or)
   b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter?  (or)
   b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology. with their applications  (or)
   b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV  b) Retrovirus  c) Pox  d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A  b) B  c) C  d) Z

3) --------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase  b) helicase  c)polymerase d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg  c) Meselson &stahl  d) Hershey & Chase

5) -------- no of codons constitute the coding dictionary
   a) 64  b) 61  c) 62  d) 60
6) CAP is involved in--------?
   a) Catabolic repression  b) Induction c) feed back inhibition  d) None of these

7)--------is an example for intercalating agent?
   a) Acridine orange  b) EMS  c) Nitrous oxide  d) UV

8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair d) all of the above

9) Davis-u-tube expt is used to prove the existance of--------?
   a) Transformation  b) conjugation  c) transduction  d0 recombination

10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11)  a) Elucidate the structure of DNA  OR
      b) Discuss the characters of a genetic material

12)  a) Prove that replication is semi conservative by a suitable experiment  OR
      b) Describe DNA polymerase

13)  a) Explain the features of genetic code  OR
      b) Discuss attenuator control in trp operon

14)  a) Discuss Ame’s test  OR
      b) Discuss photoreactivation

15)  a) Discuss briefly specialized transduction  OR
      b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16)  a) Explain the experiments that led to the establishment of DNA as genetic material  OR
      b) Explain the different forms of DNA

17)  a) How the naked DNA is condensed and organized in a prokaryotic cell?  OR
      c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved

18)  a) List and explain the negatively controlled operon in E.Coli  OR
      b) Describe the mechanism involved in the transformation of information from DNA to RNA

19)  a) Explain how the organism protects its DNA from damage?  OR
      b) Explain the phenomenon involved in generation of mutants?

20)  a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene  OR
      b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ________
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) __________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) __________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator  c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ______
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ______
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as __________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION-B (5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION-C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
        b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
        b) Give a brief note on the mechanisms involved in graft rejection.

**CORE PAPER VIII - FOOD MICROBIOLOGY**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A (10 x 1 = 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) *Serratia* (b) *Flavobacterium* (c) *Micrococcus* (d) *Klebsiella*
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min (b) 62.5°C, 30 min (c) 71.7°C, 15 sec (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) *Aspergillus* (b) *Bacillus* (c) *Saccharomyces* (d) *Serratia*
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather (b) springer (c) flipper (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce (b) yoghurt (c) bread (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) *Leuconostoc mesenteroides* (b) *Streptococcus faecalis* (c) *Pediococcus cerevisiae* (d) *Staphylococcus aureus*
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample (b) storage of sample at room temperature for 24 hr (c) gathering information (d) laboratory testing
10. The toxin produced by *Staphylococcus* sp in food is
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

**SECTION B (5 x 6 = 30 Marks) - Answer ALL Questions.**

11a) What is the significance of molds in food microbiology? Describe. (or)
        b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
        b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
        b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
        b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION-C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.
19a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.
20a) Discuss in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI  (b) EcoRI  (c) HindIII  (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase  (b) E.coli ligase  (c) Sal ligase  (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA  (b) Protein  (c) Phosphatase  (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosomal  (b) Double stranded  (c) Self replicating  (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  (c)M13 Phage  (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi.
7. Colony hybridization technique is employed for
   (a)Selection of vector  (b)Unhybridised ones  (c)Selection of desirable clones  (d)None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation  (b) Microinjection  (c) Transformation  (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus  (b) Thermus aquaticus
      (c) Thermobacter aquaticus(d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot  (b) Northern blot  (c) Western blot  (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or
   (b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or
   (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or
   (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or
   (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or
   (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or
   (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
   (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
   (b) How will you identify the presence of r DNA in a cell?
20. (a) Explain Southern blotting technique and its applications. Or
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) ----------- are broad spectrum antiviral products
   a) Histones  b) IFN  c) Streptomycin  d) Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c) Xanthococcus  d) Zymomonas
3) ----------- is involved in the fusion of myeloma cells with spleen cells
   a) PEG  b) PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as -----------
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) ----------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is -----------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c) Dinosaurs  d) Mice
8) Method is involved development of transgenic animal
   a) Microinjection  
   b) Protoplast fusion  
   c) Hybridoma technology  
   d) b and c

9) Marker are involved in DNA Fingerprinting
   a) VNTR  
   b) RFLP  
   c) RAPD  
   d) STR3

10) Father of HGP
   a) Francis Collins  
   b) Venter  
   c) James Watson  
   d) Hunkapillar

**SECTION-B (5X5=25Marks) - Answer ALL Questions.**

11a) Write a brief account on commercial biosynthesis of interferons (or)

12a) Give a short note on Antidiotpe vaccine (or)

13a) Explain in short the application and development of transgenic sheep (or)

14a) Explain in short about Ti based cointegrate vectors (or)

15a) List the scope and application of HGP (or)

**SECTION-C (5X8=40Marks) - Answer ALL Questions.**

16a) Write an essay on the commercial synthesis of small proteins (or)

17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)

18a) Discuss about Microbial insecticides (or)

19a) Discuss methodologies involved in the creation of transgenic mice also add brief note on its application (or)

20a) Write a detailed essay on DNA Fingerprinting and its application (or)

**CORE PAPER IX – FERMENTATION TECHNOLOGY**

**Duration – 3hrs**                  **Maximum – 100 Marks**

**SECTION A (10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  
   b. strain improvement  
   c. pilot scale  
   d. commercial operation

2. Glutamic acid is used for
   a. feed supplement  
   b. flavour enhancer  
   c. ethanol production  
   d. antibiotic fermentation

3. Steady state is achieved in ____________ fermentation.
   a. batch  
   b. fed-batch  
   c. continuous  
   d. all
4. Batch culture is a________________
   a. open culture system    b. system that maintains constant cell conc.
   c. system with addition of nutrients    d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product    b. Vitamin B12 as a by product
   c. Vitamin C as a by product    d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag    b. log    c. stationary    d. decline
7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore    b. Massachusetts Institute of technology
   c. MTCC    d. Imperial chemical Industries.
8. _______ _______ was at one time the most important substrate for SCP production
   a. methanol    b. methane    c. oil    d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery    b. quality control    c. sterilization    d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid    b. amino acid    c. both    d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**
11.a. Discuss the significance of microbes in the production of commercially important products.
   (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture     (or)
     .b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.     (or)
     b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making     (or)
     b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.     (or)
     b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**
16.a. Give a detailed account on the various methods of strain improvement     (or)
     b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.     (or)
     b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.     (or)
     b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.     (or)
     b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.     (or)
     b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism b) Commensalism c) Parasitism d) Synergism
2) Mycorhizal association is an example of
   a) Ammensalism b) Commensalism c) Parasitism d) Symbiosis
3) -------------------- is an example of recalcitrant compound
   a) Lignin b) Protein c) Carbohydrate d) Lipid
4) Fermentation is an an example for -------------------- degradation
   a) Aerobic b) Anaerobic c) a and b d) None of the above
5) -------------------- is a cellulolytic bacteria
   a) Pseudomonas b) Klebsiella c) Mycoplasma d) Zymomonas
6) Rhizobium exist as as --------- in the nodules
   a) Protoplast b) Bacterioides c) Mycoplasma d) None of the above
7) Azospirillum is an example for
   a) Free living b) Symbiotic c) associative d) all the above
8) According to the American standard of potability -------------------- number of E.coli can present in 100 ml of water
   a) 1 b)0 c)10 d) 100
9) Application of alum is in ------- phase of water treatment
10) Super Bug was developed and patented by
    a) Khorana b) Kohnberg c) Chakraborthy d) Sanger

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil
12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin
13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle
14a) Discuss MPN technique (or)
    b) Explain Eutrophication
15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION – C (5X12=60 Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil
17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes
18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle
19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology
20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?  (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d)M. Theiler
2. The spikes are otherwise   (a)Peplomers  (b) Capsid  (c) Envelope  (d) Coat
3. The one step growth experiment was developed by
   (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d)Max Delbruck and Emory Ellis
4. Single stranded DNA phage is   (a) T4 phage  (b) MS2  (c) QB  (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called
   (a) Conduction  (b) Transfection  (c)Insertion  (d) Induction
6. The int gene codes for the synthesis of an --------enzyme
   (a) Integrase  (b) Ligase  (c) Excisionase  (d)Replicase
7. TMV has a Linked transport of two substances in the same direction is called
   (a) Non – infectious ss RNA  (b)Infectious ss RNA
   (c) Non – infectious ss DNA  (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through
   (a) Endodesmata  (b) Pore  (c) Echodesmata  (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on
   (a) Plasma membrane  (b) cytoplasm  (c) Nucleus  (d) None of the above
10. For measles , the immunogen is
    (a) Active but attenuated  (b) Inactive but attenuated  (c)Inactive heat killed  (d) Inactivated

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an  account on cultivation of viruses in egg yolk region.  Or
    (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment.  Or
    (b)Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage.  Or
    (b) Describe lysogenic conversion and its significance.
14. (a)Write a note on penetration and uncoating of viruses in the animal cell.  Or
    (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a)Write short notes on AIDS.  Or
    (b) Give a brief outline on Rubella virus.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) Give a detailed account  on viral purification and assay methods.  Or
    (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage.  Or
    (b) Give a detailed account  on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny.  Or
    (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses.  Or
    (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenecity and laboratory diagnosis of Hepatitis B virus .  Or
    (b)Explain the pathogenecity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease
   a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called
   a. immuned  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
4. Toxigenecity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar  b. BSA  c. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces  b. urine  c. sputum  d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers. (or)
    b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)
    b. Give the features of B.anthracs
13.a. Describe the methods for diagnosis to tetanus (or)
    b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)
    b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidia. (or)
    b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples. (or)
    b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
    b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY–II

Duration – 3hrs  ximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha  b) Mycelium  c) Mould  d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci  b) P. notatum  c) Rhizopus  d) Mucor

3. Candidosis is caused mainly by _____________
   a) C. albicans  b) C. tropicalis  c) C. pseudotropicalis  d) C. krusei

4. The major organism which causes urinary tract infection is ________________
   a) E. coli  b) Salmonella  c) Shigella  d) Klebsiella

5. Traveller's diarrhea is caused by ________________
   a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli  d) Enterotoxigenic E.coli

6. Blue pus is caused by _______ a) Pseudomonas b) Vibrio  c) Salmonella  d) E. Coli

7. Sexually transmitted disease is caused by ________________
   a) Treponema  b) Klebsiella  c) Proteus  d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as___________
   a) Septicemia  b) bacteremia  c) Viremia  d) Algemia

9. MIC denotes ________________
   a) Maximum inhibitory concentration  b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration  d) None of the above

10. Endoflagella is a characteristic nature present in ________________
    a) Spirochetes  b) Salmonella  c) Proteus  d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium   (or)  b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections.  (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections.  (or)  b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance  (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections  (or)
    b) Aspergillosis Describe.

17. a) Describe Trichusis trichura  (or)
    b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli  (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis  (or)  b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients’ blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of *Mycobacterium tuberculosis*, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION B (5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. a) List the Universal Precautions.  
 b) Describe the procedures used for culturing anaerobic microorganisms.
17. a) Classify infectious biological agents on the basis of hazards.  
 b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.
18. a) Comment on the biological safety cabinets in a Microbiology laboratory.  
 b) How can individual pathogenic viruses be identified in the lab.
19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood  
 sample. What special precautions must be taken while obtaining the blood culture?  
 b) State the special precautions necessary to process a sputum sample suspected for the presence of  
*Mycobacterium tuberculosis*.
20. a) What are some transport problems associated with stool specimens? Anaerobic cultures?  
 Urine specimens?(OR)  
 b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial  
 specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY  
Duration – 3hrs  
Maximum – 100 Marks  
SECTION A ( 10 x 1= 10 Marks)  
Choose the correct answer for each from the FOUR alternatives given
1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample
2. All the following are acid fast except,
   a) *Mycobacterium*  b) *Actinomycetes*  c) *Nocardia*  d) *Staphylococci*
3. The common medium used for growing *M tuberculosis* is
   a) Blood agar  b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC+-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Kiebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*
5. Selective medium for *Staphylococci* is
   a) EMB agar  b) BSA  c) MSA  d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm
7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies  d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None
10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)

b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)

b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)

b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)

b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)

b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)

b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)

b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity.(OR)

b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)

b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe?

   Where can one obtain such information? In this information available for all pathogens.(OR)

b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
6. Hookworm infection is by
   a) Ingestion of embryonated eggs  b) Larvae penetrating through the skin
   b)  c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated in
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infection and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
b) Name the specimen collected for dermatophytooses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
b) Serodiagnosis of parasitic infections — Comment

18 a) Laboratory identification of blood protozoan — Piasmodium. (OR)
b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology / Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A**: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester.

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme**:
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) Co-Curricular activities: NSS/NCC/Physical education
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

- A-Exemplary
- B-very good
- C-good
- D-fair
- E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 fields and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

   a) A candidate will be permitted to appear for the university examinations for any semester if

      i) He/she secures not less than 75% of attendance in the number of working days during the semester.

      ii) He/she earns a progress certificate from the head of the institution, of having satisfactorily completed the course of study prescribed in the subjects as required by these regulations, and

      iii) His/her conduct has been satisfactory.

      Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and/or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

(ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

(iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10 % of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise /amend/ change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
## SCHEME OF EXAMINATIONS

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*NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining - Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques - Media preparation - Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method - Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I
Taxonomy – Principles – Modern approaches- Numerical i- Genetic, Serotaxonomy and Chemotaxonomy.

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur , nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic , Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER – IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT -III


UNIT – IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA– replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping , genetic recombination.

References
2. Freifelder, S., 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV

Fermented food – pickled cucumber, saurkraut- soy sauce, Bread, Idli – Fermented dairy products – Yoghurt and cheese.

UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application,-Microarray.

References
SEMESTER –V  
APPLICATION ORIENTED SUBJECT - I  
RECOMBINANT DNA TECHNOLOGY- II  

UNIT –I  
Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics-Biopolymers.  

UNIT –II  
Vaccines – subunit vaccines-Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology  

UNIT –III  
Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.  

UNIT IV  

UNIT -V  
DNA finger printing and its Application.  
Human Genome Project and History and its Application, Bioremediation.  

References  
SEMESTER -VI  
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplasmic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V


References

SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms 
*Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diptheriae.*

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- *Clostridium perfringens, Clostridium tetani.*

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms *Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.*

UNIT -V
Morphology, pathogenicity and laboratory diagnosis- *Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydias, Rickettsiae.*

References

5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II

MEDICAL MICROBIOLOGY - II

UNIT- I

UNIT -II

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- *Staphylococcus* and *Pseudomonas*: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References
SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of E. coli plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus and Streptococcus pyogenes.
6. Identification of clinically important fungi – Candida albicans, Cryptococcus neoformans and Aspergillus
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – Aspergillus, Mucor, Penicillium, Rhizopus
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – Entamoeba, Plasmodium, Ascaris, Taenia.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT – I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMMESTER IV  
DIPLOMA PAPER II  
DIAGNOSTIC MICROBIOLOGY – I  
(BACTERIOLOGY AND SEROLOGY)

UNIT – I  

UNIT – II  
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II  
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III  
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV  
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDLAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V  
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References

SEMESTER V

DIPLOMA PAPER III
(DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques- McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert koch  b) Louis Pasteur  c) Antony Von Leewenhock  d) Both b & c

2) Immunity mediated by antibodies are called as _________________
   a) Humoral  b) Cell mediated  c) Active  d) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) ______________ is used as a counter stain in spare staining
   a) Safranin  b) Methylene blue  c) Malachite green  d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP  b) TDT  c) D  d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um  b) 0.3 um  c) 0.4 um  d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms  b) Anaerobic organisms  c) Facultative anaerobic organisms  d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar  b) EMB agar  c) Both a & b  d) None of the above.

9) TVC refers to ____________
   a) Total viable count  b) Total viral count  c) Total viable colony  d) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant  b) Agar slant  c) Mineral oil overlay  d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theroy of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease

17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.

18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.

19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.

20) a) Describe hemocytometer (or)
      b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY

Duration – 3hrs                                                                 Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain  (b) Genus  (c) Species  (d) Group

2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram  (b) Similarity matrix  (c) Dendrogram  (d) None of the above

3. Which of the following is a motile bacterium
   (a) Esherichia coli  (b) Klebsiella  (c) Bacillus subtilis  (d) Staphylococcus aureus

4. All the following are true about Mycoplasma except
   (a) Lack cellwall  (b) Colonies have fried egg appearance  (c) Require sterols for growth
       (d) Their genome is one of the largest found in prokaryotes

5. The photosynthetic organelles in bacteria is
   (a) Chloroplast  (b) Plastid  (c) Thylakoid  (d) Pyrenoid

6. Bacteriorhodopsin is present in
   (a) Methanogens  (b) Halophiles  (c) Thermophiles  (d) Purple sulphur bacteria

7. The sexual spores formed by Agaricus is called
   (a) Ascospores  (b) Zygospores  (c) Basidiospores  (d) Sporangiospores

8. All the following are asexual spores of fungi except
   (a) Sporangiospores  (b) Zygospores  (c) Conidiospores  (d) Chlamydospores

9. The members of phaeophyta are commonly known as
   (a) Red algae  (b) Green algae  (c) Blue green algae  (d) Brown algae

10. All the following are true about protozoa except
    (a) All members have cellwall  (b) Move by flagella/pseudopodia
        (c) Unicellular  (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) What is serotaxonomy? explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.

12. (a) Give distinguishing characters of clostridium. Or
   (b) Sate the important features and significance of enterobacteria.

13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.

14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium

15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
   (b) List out and describe the genetic characters used in taxonomy.

17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of bergeys manual and its importance.

18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples.

19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.

20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds

2. Polarly flagellated bacteria is known as --------------
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occurs un eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) Describe the capsule and slime layer of prokaryotic cell.   Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum.  Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria.    Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                      Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water          (b) Pigments      (c) Light     (d) H2S

2. *Thiobacillus thiooxidans* is an example of--------
   (a) Chemoautotrophs (b) Heterotrophs (c) Photoautotrophs (d) Copiotrophs

3. The organisms which tolerate high pressure are called
   (a) Halotolerant    (b) Barotolerant  (c) Psychrophilic  (d) Thermotolerant

4. Chemostat is associated with
   (a) Synchronous culture (b) Batch culture (c) Continuous culture (d) Diauxic growth

5. All the following are intermediates of TCA cycle except
   (a) Citric acid   (b) Fumaric acid  (c) Lactic acid  (d) Ketoglutaric acid

6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP            (b) ED            (c) HMP        (d) TCA cycle

7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound (b) Oxygen       (c) Nitrogenous compound (d) Carbon dioxide

8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae* (b) *Chlorella* sp (c) *Klebsiella* sp (d) *Escherichia coli*

9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water          (b) Sunlight       (c) H2S        (d) O2

10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid          (b) Carbohydrate  (c) Protein   (d) None of the above

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria.  Or
    (b) What are copiotrophs? Describe with suitable examples.

12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.

13. (a) Giving suitable example , describe substrate level phosphorylation.  Or
    (b) Describe ED pathway.

14. (a) Describe alcoholic fermentation.  Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.

15. (a) What is anoxygenic photosynthesis? Describe.  Or
    (b) Give a brief note on Bioluminescence.

SECTION – C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria.  Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.

17. (a) Discuss in detail the different phases of growth.  Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization  b. incineration  c. autoclave  d. oven.
3. Lyophilization is the
   a. separation of proteins  b. sudden freezing and dehydration  c. enzyme reaction by oxidation  d. high pressure–segmentation.
4. The pH is defined as
   a. logH⁺  b. log2H⁺  c. -logH⁺  d. -log2H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solution  b. nucleic acid  c. proteins  d. enzymes.
8. NPK analysis is done using
   a. electrophoresis  b. centrifugation  c. flame photo  d. chromatography.
9. The pH of the blood is
   a. 6.3  b. 7.4  c. 7.0  d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION B(5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
     b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
     b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
     b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g, the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)

   b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology.
   with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------ to prove that the RNA also act as genetic material
   a) TMV       b) Retrovirus       c) Pox       d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A       b) B       c) C       d) Z

3) -----------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase       b) helicase       c)polymerase       d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad       b) Tautam &Lederberg       c) Meselson &stahl       d) Hershey & Chase

5) ----------- no of codons constitute the coding dictionary
   a) 64       b) 61       c) 62       d) 60
6) CAP is involved in---------?
   a) Catabolic repression   b) Induction c) feed back inhibition d) None of these
7) ------------is an example for intercalating agent?
   a) Acridine orange   b) EMS   c) Nitrous oxide   d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS   b) photoreactivation   c) Exision repair d) all of the above
9) Davis-u-tube expt is used to prove the existance of--------?
   a) Transformation b) conjugation   c) transduction d0 recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith   b) Sanger   c) Grick   d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA   OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment   OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code   OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test   OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction   OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material   OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?   OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli   OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?   OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene   OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) ________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ____________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ____________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
   b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or) b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or) b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY
Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min (b) 62.5°C, 30 min (c) 71.7°C, 15 sec (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus (b) Bacillus (c) Saccharomyces (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather (b) springer (c) flipper (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce (b) yoghurt (c) bread (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides (b) Streptococcus faecalis (c) Pediococcus cerevisiae (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample (b) storage of sample at room temperature for 24 hr (c) gathering information (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

SECTION – B (5X6=30Marks) - Answer ALL Questions.
11a) What is the significance of molds in food microbiology? Describe. (or)
   b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
   b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
   b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
   b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.
19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI    (b) EcoRI    (c) HindIII    (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase    (b) E.coli ligase    (c) Sal ligase    (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA    (b) Protein    (c) Phosphatase    (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosomal    (b) Double stranded    (c) Self replicating    (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid    (b) Phage lambda    (c)M13 Phage    (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage    (b) Plasmid    (c) Plasmid and phage    (d) Fungi.
7. Colony hybridization technique is employed for
   (a)Selection of vector    (b)Unhybridised ones    (c)Selection of desirable clones    (d)None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation    (b) Microinjection
   (c) Transformation    (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus    (b) Thermus aquaticus
   (c) Thermobacter aquaticus(d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot    (b) Northern blot    (c) Western blot    (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or  (b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or  (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or  (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or  (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or  (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or  (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or  (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or  (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or  (b) How will you identify the presence of r DNA in a cell?.
20. (a) Explain Southern blotting technique and its applications. Or  (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs
aximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) ------------ are broad spectrum antiviral products
   a) Histones  b)IFN  c) Streptomycin  d)Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c)Xanthococcus  d) Zymomonas
3) ------------ is involved in the fusion of myloma cells with spleen cells
   a) PEG  b)PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as ----------
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) ----------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is -----------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c)Dinosaurs  d) Mice
8) Method is involved development of transgenic animal
   a) Microinjection   b) Protoplast fusion   c) Hybridoma technology   d) b and c
9) Marker are involved in DNA Fingerprinting
   a) VNTR   b) RFLP   c) RAPD   d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11a) Write a brief account on commercial biosynthesis of interferons (or)
    b) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application and development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION–C (5X8=40Marks) - Answer ALL Questions.

16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application (or)
    b) Discuss about transgenic - goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening   b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in fermentation.
   a. batch   b. fed-batch  c. continuous  d. all
4. Batch culture is a________________
   a. open culture system     b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system
5. Streptomycin fermentation by S. griseus produces
   a. Vitamin B2 as a by product    b. Vitamin B12 as a by product
   c. Vitamin C as a by product    d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag     b. log     c. stationary     d. decline
7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore       b. Massachusetts Institute of technology
   c. MTCC       d. Imperial chemical Industries.
8. ___________ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery     b. quality control     c. sterilization     d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid     b. amino acid     c. both     d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**
11.a. Discuss the significance of microbes in the production of commercially important products.
     (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture     (or)
     b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.     (or)
     b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making     (or)
     b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.     (or)
     b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**
16.a. Give a detailed account on the various methods of strain improvement    (or)
     b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.    (or)
     b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.    (or)
     b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.    (or)
     b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.    (or)
     b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is a) Ammensalism b) Commensalism c) Parasitism d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism b) Commensalism c) Parasitism d) Symbiosis

3) -------------- is an example of recalcitrant compound
   a) Lignin b) Protein c) Carbohydrate d) Lipid

4) Fermentation is an example for -------------- degradation
   a) Aerobic b) Anaerobic c) a and b d) None of the above

5) -------------- is a cellulolytic bacteria
   a) Pseudomonas b) Klebsiella c) Mycoplasma d) Zymomonas

6) Rhizobium exist as -------------- in the nodules
   a) Protoplast b) Bacterioides c) Mycoplasma d) None of the above

7) Azospirillum is an example for
   a) Free living b) Symbiotic c) associative d) all the above

8) According to the American standard of potability -------------- number of E.coli can present in 100 ml of water a) 1 b)0 c)10 d) 100

9) Application of alum is in -------------- phase of water treatment

10) Super Bug was developed and patented by --------------
    a) Khorana b) Kohnberg c) Chakraborthy d) Sanger

SECTION – B (5X6 = 30 Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION – C (5X12 = 60 Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV? (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) M. Theiler
2. The spikes are otherwise (a) Peplomers (b) Capsid (c) Envelope (d) Coat
3. The one step growth experiment was developed by (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is (a) T4 phage (b) MS2 (c) QB (d) OX 174
5. The process of release of the prophage from the bacterial DNA is called (a) Conduction (b) Transfection (c) Insertion (d) Induction
6. The int gene codes for the synthesis of an enzyme (a) Integrase (b) Ligase (c) Excisionase (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA (b) Infectious ss RNA (c) Non – infectious ss DNA (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through (a) Endodesmata (b) Pore (c) Echodesmata (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane (b) cytoplasm (c) Nucleus (d) None of the above
10. For measles, the immunogen is (a) Active but attenuated (b) Inactive but attenuated (c) Inactive heat killed (d) Inactivated

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or (b) Give a brief outline on Rubella virus.

SECTION – C (5X12=60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs

Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease
   a. Malaria b. filariasis c. plaque d. all the above
2. Persons with symptomless infection is called
   a. immune b. carrier c. vector d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococci b. staphylococci c. Pseudomonas d. Vibrio
4. Toxigenecity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus b. Corynebacterium c. Clostridium d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease b. lock jaw c. hepatitis d. rabies
7. Food borne intoxication is caused by a. Salmonella b. E.coli c. Shigell d. Staphylococcus
8. Darting motility is seen with a. E.coli b. Streptococcus c. V.cholerae d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar b. BSA c. LJ d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces b. urine c. sputum d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers. (or)
    b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)
    b. Give the features of B.anthracs
13.a. Describe the methods for diagnosis to tetanus (or)
    b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)
    b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidia. (or)
    b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples. (or)
    b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
    b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs maximum – 75 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha b) Mycelium c) Mould d) Fungi
2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci b) P. notatum c) Rhizopus d) Mucor
3. Candidosis is caused mainly by _____________
   a) C. albicans b) C. tropicalis c) C. pseudotropicalis d) C. krusei
4. The major organism which causes urinary tract infection is ______________
   a) E. coli b) Salmonella c) Shigella d) Klebsiella
5. Traveller's diarrhea is caused by ______________
   a) Enteropathogenic E. coli b) Enterotoxigenic E. coli c) Enteroinvasive E. coli d) Enterotoxigenic E.coli
6. Blue pus is caused by _______ a) Pseudomonas b) Vibrio c) Salmonella d) E. Coli
7. Sexually transmitted disease is caused by ______________
   a) Treponema b) Klebsiella c) Proteus d) Pseudomonas
8. Invasion of microorganisms into the bloodstream is called as ______________
   a) Septicemia b) bacteremia c) Viremia d) Algemia
9. MIC denotes ______________
   a) Maximum inhibitory concentration b) Minimum inhibitory concentration c) Multiple inhibitory concentration d) None of the above
10. Endoflagella is a characteristic nature present in ______________
    a) Spriochetes b) Salmonella c) Proteus d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis
12. a) Comment on Taenia solium (or) b) Give a brief note on Ascaris.
13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.
14. a) Describe briefly on pyogenic infections. (or) b) Comment on Pseudomonas.
15. a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.
17. a) Describe Trichus trichura (or)
    b) Comment on Wucheraria bancrofti
18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.
19. a) Comment on meningitis (or) b) Describe pyrexia
20. a) Describe drug resistance nature of bacteria (or)
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients’ blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION B(5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C (5X12=60Marks) - Answer ALL Questions.
16. a) List the Universal Precautions. (OR)
   b) Describe the procedures used for culturing anaerobic microorganisms.
17. a) Classify infectious biological agents on the basis of hazards. (OR)
    b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.
18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
    b) How can individual pathogenic viruses be identified in the lab.
19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
    b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.
20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
    b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample
2. All the following are acid fast except,
   a) *Mycobacterium*  b) *Actinomycetes*  c) *Nocardia*  d) *Staphylococci*
3. The common medium used for growing *M. tuberculosis* is
   a) Blood agar  b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics IMViC+++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Klebsiella pneumoniae* c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*
5. Selective medium for *Staphylococci* is a) EMB agar b) BSA c) MSA d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm
7. VDRL is an example for
   a) Agglutination  b) Precipitation c) Complement fixation test  d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh (D) - negative b) are “universal recipients” of transfusion c) have circulating anti A and B antibodies d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen  b) Antibody c) Antigen and Antibody d) None
10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe?
   Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Growth medium for fungus inhibits growth of
   a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica  b) Entamoeba coil  c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs.  b) Larvae penetrating through the skin
   b)  c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing
    another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was
    this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces.(OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics.(OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about
    what can be done to relieve symptoms of a viral infections and recover most quickly.(OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture.(OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION – C (5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dermatophytoises. Is it necessary to store such specimens?
      How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium*. (OR)
    b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
    b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
    b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**

Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**

The course of study for the UG degree courses of all branches shall consist of the following

a) **Part - I**

Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

The subject shall be offered during the first four semesters with one examination at the end of each semester.

b) **Part – II : English**

The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

c) **Foundation Course**

The Foundation course shall comprise of two stages as follows:

Foundation Course A : General Awareness (I & II semesters)
Foundation Course B : Environmental Studies (III & IV semesters)

The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.

- From the printed material supplied by the University: 75%
- Current affairs & who is who?: 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A**: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application–oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

a) A candidate will be permitted to appear for the university examinations for any semester if

i) He/she secures not less than 75% of attendance in the number of working days during the semester.

ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and

iii) His/her conduct has been satisfactory.

Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

d) A candidate who has secured less than 65%of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

    a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

    b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

    (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

    (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**

   No candidate shall be eligible for conferment of the Degree unless he / she,
   
i. has undergone the prescribed course of study for a period of not less than six semesters in an
   institution approved by/affiliated to the University or has been exempted from in the manner
   prescribed and has passed the examinations as have been prescribed therefor.
   
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a
   certificate issued by the Principal of the institution.
   
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as
   evidenced by certificate issued by the Principal of the College.

12. **Ranking**

   A candidate who qualifies for the UG degree course passing all the examinations in the
   first attempt, within the minimum period prescribed for the course of study from the date of
   admission to the course and secures I or II class shall be eligible for ranking and such ranking
   will be confined to 10% of the total number of candidates qualified in that particular branch of
   study, subject to a maximum of 10 ranks.
   
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**

   Any candidate who wishes to obtain an additional UG degree not involving any practical
   shall be permitted to do so and such candidate shall join a college in the III year of the course
   and he/she will be permitted to appear for par III alone by granting exemption form appearing
   Part I, Part II and common allied subjects (if any), already passed by the candidate. And a
   candidate desirous to obtain an additional UG degree involving practical shall be permitted to
   do so and such candidate shall join a college in the II year of the course and he/she be permitted
   to appear for Part III alone by granting exemption form appearing for Part I, Part II and the
   common allied subjects. If any, already passed. Such candidates should obtain exemption from
   the university by paying a fee of Rs.500/-.

14. **Evening College**

   The above regulations shall be applicable for candidates undergoing the respective
   courses in Evening Colleges also.

15. **Syllabus**

   The syllabus for various subjects shall be clearly demarcated into five viable units in each
   paper/subject.

16. **Revision of Regulations and Curriculum**

   The above Regulation and Scheme of Examinations will be in vogue without any change
   for a minimum period of three years from the date of approval of the Regulations. The
   University may revise/amend/change the Regulations and Scheme of Examinations, if found
   necessary.

17. **Transitory Provision**

   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will
   be permitted to take the Examinations under those Regulations for a period of four years i.e. up
   to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the
   Examination only under the Regulations in force at that time.
# SCHEME OF EXAMINATIONS

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<th>Sem</th>
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* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining - Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS - Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques - Media preparation - Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique-- Wright’s tube, Roll tube, McIntost fildes jar method - Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A Core Practical 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygeneic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave , Hot air oven , Incubator , Water Bath , Laminar air flow, BOD incubator, Centrifuges – Bench top , High sped , Ultra centrifuge.

UNIT – II

pH meter , Conductivity meter, Lyophilizer , McIntosh anaerobic jar , Biosensor, Metabolic shaker.

UNIT -III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
SEMESTER IV

GRA CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER - V

CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S., 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER - V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER – V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT - II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT - III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT - IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application, -Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI

CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose, Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organic wastes- sugarcane waste-coir pith composition- composting, principles and Applications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References
SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I

Early development of virology – general properties of viruses- cultivation of
Viruses- virus purification and assays. The structure of viruses- virion size-
General structure properties- helical capsids, icosohedral capsid- nucleic acids-
Viral envelopes and enzymes- virus classification.

UNIT- II

Reproduction of DNA phages- ds DNA lytic phages- lytic cycle of T4 phage
The one step growth- adsorption to the host cell and penetration- synthesis of
Phage nucleic acids and protein assembly of phage particles- release of phage
particles. Example of ss DNA phage- OX 174- circle replication.

UNIT-III

Lysogeny- temperate bacteriophages- lambda phage- induction of lysogens-

UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of
Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A,B).
Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References
edition, Wiley and sons.

SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diptheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.

UNIT -V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydiass, Rickettsiae.

References
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT - I

UNIT - II

UNIT - III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT - IV
Pyogenic infections- *Staphylococcus* and *Pseudomonas*: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT - V

References


SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia.*
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT – I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III

DIAGNOSTIC MICROBIOLOGY –II

(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs

Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert Koch  b) Louis Pasteur  c) Antony Von Leewenhock  d) Both b & c

2) Immunity mediated by antibodies are called as _________________
   a) Humoral  b) Cell mediated  c) Active  c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) _____________ is used as a counter stain in spare staining
   a) Safranin  b) Methylene blue  c) Malachite green  d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP  b) TDT  c) D  d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um  b) 0.3 um  c) 0.4 um  d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms  b) Anaerobic organisms  
   c) Facultative anaerobic organisms  d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar  b) EMB agar  c) Both a & b  d) None of the above.

9) TVC refers to ____________
   a) Total viable count  b) Total viral count  c) Total viable colony  c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant  b) Agar slant  c) Mineral oil overlay  d) a,b & c.

SECTION B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and Koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe Koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY

Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain  (b) Genus  (c) Species  (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram  (b) Similarity matrix  (c) Dendrogram  (d) None of the above
3. Which of the following is a motile bacterium
   (a) Esherichia coli  (b) Klebsiella  (c) Bacillus subtilis  (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall  (b) Colonies have fried egg appearance  (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast  (b) Plastid  (c) Thylakoid  (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens  (b) Halophiles  (c) Thermophiles  (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores  (b) Zygosporres  (c) Basidiospores  (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores  (b) Zygosporres  (c) Conidiospores  (d) Chlamydospores
9. The members of phaëophyta are commonly known as
   (a) Red algae  (b) Green algae  (c) Blue green algae  (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall  (b) Move by flagella/pseudopodia
       (c) Unicellular  (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or 
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or 
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or 
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.
14. (a) Explain the life cycle of Mucor Or 
   (b) Describe briefly the life cycle of Dictyostelium.
15. (a) Give a brief account of pseudopodia. Or 
   (b) Explain the general characters and the importance of Euglenophyta.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach? Or 
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or 
   (b) Give a detailed account of Bergeys manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or 
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples.
19. (a) Discuss in detail the general characteristics of fungi. Or 
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or 
   (b) Explain the general characters of Sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. The chemical nature of Gram negative bacteria 
   (a) Peptidoglycan (b) Lipopolysaccharide 
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds
2. Polarly flagellated bacteria is known as ---------
   (a) Lophotrichous (b) Peritrichous 
   (c) Atrichous (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaea the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

SECTION – B (5X6=30Marks) - Answer ALL Questions.
11. (a) Describe the capsule and slime layer of prokaryotic cell.  Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum.  Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis.  Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion.  Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaea.  Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION – C (5X12=60Marks)
Answer ALL Questions.
16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization.  Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast.  Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell.  Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles.  Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water          (b) Pigments     (c) Light      (d) H2S
2. *Thiobacillus thiooxidans* is an example of---------
   (a) Chemoautotrophs (b) Heterotrophs (c) Photoautotrophs (d) Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant   (b) Barotolerant (c) Psychrophilic   (d) Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture      (b) Batch culture    (c) Continuous culture (d) Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid              (b) Fumaric acid   (c) Lactic acid            (d) Ketoglutaric acid
6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP       (b) ED          (c) HMP         (d) TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound               (b) Oxygen   (c) Nitrogenous compound          (d) Carbon dioxide
8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*    (b) *Chlorella* sp  (c) *Klebsiella* sp   (d) *Escherichia coli*
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water                     (b) Sunlight     (c) H2S       (d) O2
10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid                    (b) Carbohydrate (c) Protein      (d) None of the above

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.
13. (a) Giving suitable example, describe substrate level phosphorylation. Or
    (b) Describe ED pathway.
14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a) What is anoxygenic photosynthesis? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION – C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria. Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway?  Or  
(b) What is oxidative phosphorylation? Describe.  
19. (a) Explain briefly the propionic acid fermentation.  Or  
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.  
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall.  Or  
(b) Describe the C3 pathway of Co2 fixation.  

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS  
Duration – 3hrs  Maximum – 100 Marks  

SECTION A ( 10 x 1= 10 Marks)  
Choose the correct answer for each from the FOUR alternatives given.  
1. Hot air oven functions based on the principle of  
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.  
2. Moist heat sterilization is achieved by  
   a. lyophilization  b. incineration  c. autoclave  d. oven.  
3. Lyophilization is the  
   a. separation of proteins  b. sudden freezing and dehydration  c. enzyme reaction by oxidation  d. high pressure–segmentation.  
4. The pH is defined as  
   a. logH+  b. log2H+  c. -logH+  d. -log2H+  
5. Which is used as an absorbent in TLC.  
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel  
6. SDS-PAGE is used to separate  
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.  
7. UV light is significantly absorbed by  
   a. coloured solutio  b. nucleic acid  c. proteins  d. enzymes.  
8. NPK analysis is done using  
   a. electrophoresi  b. centrifugation.  c. flame photo  d. chromatography.  
9. The pH of the blood is  
   a. 6.3  b. 7.4  c. 7.0  d. 7.6  
10. What is the normality of 5M NaOH solution?  

SECTION–B(5X6=30Marks) - Answer ALL Questions.  
11.a. With a schematic diagram, describe the working of a laminar flow chamber.  
   (or)  
   b. Explain the working of an incubator.  
12.a. Explain the electrodes used in pH measurement.  
   (or)  
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.  
13.a. What is paper chromatography?  
   (or)  
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry.  (or)
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**

16.a. Discuss the principle, types and applications of centrifuge.  (or)
b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications.  (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography.  (or)
b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter?  (or)
b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology. With their applications  (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

**CORE PAPER VI - MICROBIAL GENETICS**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A ( 10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV  b) Retrovirus  c) Pox  d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A  b) B  c) C  d) Z

3) ----------Enzyme resolves the super coiling during replication of *E.Coli*
   a) gyrase  b) helicase  c)polymerase  d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg  c) Meselson &stahl  d) Hershey & Chase

5) ---------- no of codons constitute the coding dictionary
   a) 64  b) 61  c) 62  d) 60
6) CAP is involved in---------?
   a) Catabolic repression  b) Induction c) feed back inhibition       d) None of these
7) ---------is an example for intercalating agent?
   a) Acridine orange   b) EMS   c) Nitrous oxide       d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS   b) photoreactivation   c) Exision repair d) all of the above
9) Davis-u-tube expt is used to prove the existance of--------?
   a) Transformation b) conjugation c) transduction d0 recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith b) Sanger   c) Grick d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell? OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage? OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ________
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) __________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) __________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ____________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to ________
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as ____________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ______
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ____________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ____________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION – B (5X6 = 30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C (5X12 = 60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or) b) Describe ELISA.

20) a) Give a detailed note on ABO blood group system. (or) b) Give a brief note on the mechanisms involved in graft rejection.

**CORE PAPER VIII - FOOD MICROBIOLOGY**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A (10 x 1 = 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) aminoacids

2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella

3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min (b) 62.5°C, 30 min (c) 71.7°C, 15 sec (d) 71.7°C, 15 min

4. Ropiness of bread is caused by species of
   (a) Aspergillus (b) Bacillus (c) Saccharomyces (d) Serratia

5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice

6. A can with a minute leak during storage is called a
   (a) breather (b) springer (c) flipper (d) sparger

7. The term leavening is associated with the preparation of
   (a) soy sauce (b) yoghurt (c) bread (d) cheese

8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides (b) Streptococcus faecalis (c) Pediococcus cerevisiae (d) Staphylococcus aureus

9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample (b) storage of sample at room temperature for 24 hr (c) gathering information (d) laboratory testing

10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

**SECTION B (5X6 = 30 Marks) - Answer ALL Questions.**

11a) What is the significance of molds in food microbiology? Describe. (or) b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.

12a) Discuss the drying process as a method of food preservation. (or) b) Explain the role of radiation in food preservation.

13a) What are the various rots of eggs produced by bacteria? Describe. (or) b) Describe the colour changes in milk due to the growth of spoilage microorganisms.

14a) Describe briefly the production of soy sauce. (or) b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.

16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.

17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.

18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.

19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.

20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. GAATTC is the recognition sequence of
   (a) BamHI      (b) EcoRI    (c) HindIII  (d) HaeIII

2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase    (b) E.coli ligase  (c) Sal ligase (d) All

3. Phosphoramidite method is used for the synthesis of
   (a) DNA       (b) Protein    (c) Phosphatase (d) Phosphoric acid

4. Plasmids are DNA strands which are
   (a) Extrachromosomal (b) Double stranded (c) Self replicating (d) All the above

5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage  (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of
   (a) Phage           (b) Plasmid     (c) Plasmid and phage (d) Fungi.

7. Colony hybridization technique is employed for
   (a) Selection of vector (b) Unhybridised ones (c) Selection of desirable clones (d) None of the above

8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation  (b) Microinjection  
   (c) Transformation (d) None

9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus (b) Thermus aquaticus
   (c) Thermobacter aquaticus (d) Thermus aquatica

10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot    (b) Northern blot (c) Western blot  (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning.  
(b) Explain the action of Methylases.
12. (a) Write a note on YAC.  
(b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis.  
(b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone?  
(b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique.  
(b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses.  
(b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library.  
(b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  
(b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques.  
(b) How will you identify the presence of r DNA in a cell?.
20. (a) Explain Southern blotting technique and its applications.  
(b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs  
aximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) ----------- are broad spectrum antiviral products  
a) Histones  b)IFN  c) Streptomycin  d)Nystatin
2) Xanthan gum is produced from  
a) Pseudomonas putida  b) Xanthomonas campestris  c)Xanthococcus  d) Zymomonas
3) ----------- is involved in the fusion of myloma cells with spleen cells  
a) PEG  b)PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as -----------  
a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) ----------- required for the transfer of the T DNA from A. tumifacience to plant cells  
a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is -----------  
a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis  
a) Monkey  b) Snake  c)Dinosaurs  d) Mice
8) ------------ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) ------------ marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION –B(5X5=25Marks) - Answer ALL Questions.

11a) Write a brief account on commercial biosynthesis of interferons  (or)
    d) List the us Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application ad development of transgenic sheep  (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP  (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION –C (5X8=40Marks) - Answer ALL Questions.

16a) Write an essay on the commercial synthesis of small proteins  (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies  (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application  (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a deailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in _____________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a________________
   a. open culture system   b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system

5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product

6. Antibiotics by microbes are usually elaborated at --------- stage of their growth.
   a. lag   b. log   c. stationary   d. decline

7. The term single –cell protein was coined at--------- in 1966
   a. CFTRI, Mysore   b. Massachusetts Institute of technology
   c. MTCC   d. Imperial chemical Industries.

8. ____________ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal

9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control   c. sterilization   d. packaging

10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid   c. both   d. none

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. Discuss the significance of microbes in the production of commercially important products.
     (or)  b. Write a short note on the isolation of alkaline protease producers from soil.

12.a. Explain briefly batch culture (or)
     .b. Differentiate submerged and solid state fermentation.

13.a. Describe in detail fungal protease production. (or)
     .b. Discuss the methods of immobilization and add a note on its significance.

14.a. Describe the role of yeast in bread making (or)
     .b. Write about single cell protein.

15.a. Discuss the methods distruption of cells by physical methods. (or)
     .b. Write short notes on batch filters that are employed in down streaming processing.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Give a detailed account on the various methods of strain improvement (or)
     b. Discuss the methods for screening of industrially important microorganism

17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor. (or)
     b. Give a detailed account on solid state fermentation with its applications.

18.a. Elaborate on the various steps involved in beer production. (or)
     b. Write an essay on the commercial production in beer production.

19.a. Explain briefly the industrial application of yeast. (or)
     b. Describe in detail the development of Oyster mushroom.

20.a. Describe in detail the recovery and purification of intracellular products with examples. (or)
     b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism   b) Commensalism   c) Parasitism   d) Synergism
2) Mycorhizal association is an example of
   a) Ammensalism   b) Commensalism   c) Parasitism   d) Symbiosis
3) -------------------- is an example of recalcitrant compound
   a) Lignin   b) Protein   c) Carbohydrate   d) Lipid
4) Fermentation is an example for ----------- degradation
   a) Aerobic b) Anaerobic c) a and b d) None of the above
5) -------------- is a cellulosolytic bacteria
   a) Pseudomonas   b) Klebsiella   c) Mycoplasma   d) Zymomonas
6) Rhizobium exist as ----------- in the nodules
   a) Protoplast   b) Bacterioides   c) Mycoplasma   d) None of the above
7) Azospirillum is an example for
   a) Free living   b) Symbiotic   c) associative   d) all the above
8) According to the American standard of potability ----------- number of E.coli
   can present in 100 ml of water a) 1 b) 0 c) 10 d) 100
9) Application of alum is in ------- phase of water treatment
10) Super Bug was developed and patented by -------
    a) Khorana   b) Kohnberg   c) Chakraborthy   d) Sanger

SECTION B (5X6 = 30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil
12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin
13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle
14a) Discuss MPN technique (or)
    b) Explain Eutrophication
15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION C (5X12 = 60Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil
17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes
18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle
19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology
20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?
   (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) M. Theiler

2. The spikes are otherwise
   (a) Peplomers  (b) Capsid  (c) Envelope  (d) Coat

3. The one step growth experiment was developed by
   (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) Max Delbruck and Emory Ellis

4. Single stranded DNA phage is
   (a) T4 phage  (b) MS2  (c) QB  (d) O X 174

5. The process of release of the prophage from the bacterial DNA is called
   (a) Conduction  (b) Transfection  (c) Insertion  (d) Induction

6. The int gene codes for the synthesis of an enzyme
   (a) Integrase  (b) Ligase  (c) Excisionase  (d) Replicase

7. TMV has a Linked transport of two substances in the same direction is called
   (a) Non – infectious ss RNA  (b) Infectious ss RNA
   (c) Non – infectious ss DNA  (d) Infectious ss DNA

8. Plant viruses penetrate the host cells through
   (a) Endodesmata  (b) Pore  (c) Echodesmata  (d) None of the above

9. In Herpes viridae the viral envelope adsorbs to the receptors on
   (a) Plasma membrane  (b) Cytoplasm  (c) Nucleus  (d) None of the above

10. For measles, the immunogen is
    (a) Active but attenuated  (b) Inactive but attenuated  (c) Inactive heat killed  (d) Inactivated

SECTION – B (5X6 = 30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or
    (b) Write a note on viral envelopes and enzymes.

12. (a) Explain the one step growth experiment. Or
    (b) Give an account on the structure of a typical bacterial virus.

13. (a) Give an account on reproduction of RNA phage. Or
    (b) Describe lysogenic conversion and its significance.

14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or
    (b) Write a note on characteristics of the viruses that infect algae and fungi.

15. (a) Write short notes on AIDS. Or
    (b) Give a brief outline on Rubella virus.

SECTION – C (5X12 = 60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or
    (b) Give a brief account on the early development of virology.

17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or
    (b) Give a detailed account on ss DNA phage.

18. (a) Describe the temperate bacteriophages and lysogeny. Or
    (b) Give a brief account on generation of defective phages and their uses.

19. (a) Explain briefly the reproduction of plant viruses. Or
    (b) Give a detailed account on viruses and cancer.

20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or
    (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease
   a. Malaria     b. filariasis     c. plaque     d. all the above
2. Persons with symptomless infection is called
   a. immuned     b. carrier     c. vector     d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococci     b. staphylococci     c. Pseudomonas     d. Vibrio
4. Toxigenecity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus     b. Corynebacterium     c. Clostridium     d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease     b. lock jaw     c. hepatitis     d. rabies
7. Food borne intoxication is caused by a. Salmonella     b. E.coli     c. Shigell     d. Staphylococcus
8. Darting motility is seen with a. E.coli     b. Streptococcus     c. V.cholerae     d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar     b. BSA     c. LJ     d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces     b. urine     c. sputum     d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers.     (or)
     b. State Koch postulates.

12.a. Give the features of Streptococcus.     (or)
     b. Give the features of B.anthracis

13.a. Describe the methods for diagnosis to tetanus     (or)
     b. Describe the methods for diagnosis of gas gangrene.

14.a. Write a short note on enteric fever.     (or)
     b. Write a short note on bacillary dysentery.

15.a. Give the features of Chlamidiae.     (or)
     b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples.     (or)
     b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.

17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same?     (or)
     b. Give an account of Staphylococcus aureus its morphology and diagnosis.

18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani.     (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.

19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli.     (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.

20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum.     (or)
     b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha b) Mycelium c) Mould d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci b) P. notatum c) Rhizopus d) Mucor

3. Candidosis is caused mainly by _____________
   a) C. albicans b) C. tropicalis c) C. pseudotropicalis d) C. krusei

4. The major organism which causes urinary tract infection is ______________
   a) E. coli b) Salmonella c) Shigella d) Klebsiella

5. Traveller's diarrhea is caused by _______________
   a) Enteropathogenic E. coli b) Enterotoxigenic E. coli
c) Enteroinvasive E. coli d) Enterotoxigenic E.coli

6. Blue pus is caused by _______ a) Pseudomonas b) Vibrio c) Salmonella d) E. Coli

7. Sexually transmitted disease is caused by ______________
   a) Treponema b) Klebsiella c) Proteus d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as _____________
   a) Septicemia b) bacteremia c) Viremia d) Algemia

9. MIC denotes _______________
   a) Maximum inhibitory concentration b) Minimum inhibitory concentration
c) Multiple inhibitory concentration d) None of the above

10. Endoflagella is a characteristic nature present in ______________
   a) Spirochetes b) Salmonella c) Proteus d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium (or) b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or) b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16.a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17.a) Describe *Trichus trichura* (or)
    b) Comment on *Wucheraria bancrofti*

18.a) Describe the etiology and lab diagnosis of diarrhegenic *E.Coli* (or)
    b) Comment on pyogenic infections caused by *Staphylococcus*.

19.a) Comment on meningitis (or) b) Describe pyrexia

20.a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs   Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   d) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuart's medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of *Mycobacterium tuberculosis*, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections? (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method? (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. a) List the Universal Precautions.(OR)
b) Describe the procedures used for culturing anaerobic microorganisms.
17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.
18. a) Comment on the biological safety cabinets in a Microbiology laboratory.(OR)
b) How can individual pathogenic viruses be identified in the lab.
19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.
20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens?(OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample
2. All the following are acid fast except,
   a) *Mycobacterium* b) *Actinomycetes* c) *Nocardia* d) *Staphylococci*
3. The common medium used for growing *M tuberculosis* is
   a) Blood agar b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli* b) *Kiebsiella pneumoniae* c) *Proteus vulgaris* d) *Pseudomonas aeruginosa*
5. Selective medium for *Staphylococci* is a) EMB agar b) BSA c) MSA d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm b) 24mm c) 28mm d) 30mm
7. VDRL is an example for
   a) Agglutination b) Precipitation c) Complement fixation test d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh (D) - negative b) are “universal recipients” of transfusion
c) have circulating anti A and B antibodies d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen b) Antibody c) Antigen and Antibody d) None
10. Blotting of DNA is called
    a) Western blot b) Southern blot c) Northern blot d) Dot blot.
**SECTION–B (5X6=30Marks) - Answer ALL Questions.**

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
    b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
    b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
    b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
    b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
    b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

**SECTION–C (5X12=60Marks) - Answer ALL Questions.**

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
    b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
    b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
    b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
    b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe?
    Where can one obtain such information? In this information available for all pathogens. (OR)
    b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Growth medium for fungus inhibits growth of
   a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
6. Hookworm infection is by
   a) Ingestion of embryonated eggs  b) Larvae penetrating through the skin
   c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION –B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing
    another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically
    was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about
    what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dermatophytoses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium*. (OR)
    b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
    b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
    b) Immunofluorescence — a technique to detect viral infections — Explain.
REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY with Semester System (with effect from 2007-2008)

1. Eligibility for Admission to the Course
Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. Duration of the Course
The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. Course of Study
The course of study for the UG degree courses of all branches shall consist of the following

a) Part - I
Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

The subject shall be offered during the first four semesters with one examination at the end of each semester.

b) Part – II : English
The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

c) Foundation Course
The Foundation course shall comprise of two stages as follows:
Foundation Course A : General Awareness (I & II semesters)
Foundation Course B : Environmental Studies (III & IV semesters)

The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.

- From the printed material supplied by the University - 75%
- Current affairs & who is who? - 25%

Annexure No. 38 A
SCAA Dated 29.02.2008
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A**: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester.

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme**:
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows:

- A-Exemplary
- B-very good
- C-good
- D-fair
- E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**
   
a) A candidate will be permitted to appear for the university examinations for any semester if
   
i) He/she secures not less than 75% of attendance in the number of working days during the semester.

   ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and

   iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**
   
a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical ) in the University examination shall be declared to have passed the examination in the subject (theory or Practical ).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

    a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

    b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

    (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

    (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   
i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
   
ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   
iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10 % of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   
The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
# SCHEME OF EXAMINATIONS

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*NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram”s, Spore, AFB_),Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, Mclntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II
Taxanomy of Eubacteria and Actinomycetes – Detailed classification upto genus level with general characters of each group – Bergey’s Manual and its importance.

UNIT – III
Taxanomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxanomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitorgenous compounds and Co2 as final electron acceptor. Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT –III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References

2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S., 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V  
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY 

UNIT- I  
History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II  
Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III  
Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV  
Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V  
Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins-Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application,-Microarray.

References


SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application , Bioremediation.

References
SEMESTER - VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT - I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplasmic fusion.

UNIT - II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT - III


UNIT - IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT - V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References

SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V


References


SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of
epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
*Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diphtheriae.*

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms-
*Clostridium perfringens, Clostridium tetani.*

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms
*Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.*

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- *Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydia, Rickettsiae.*

References

5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT- I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancroftii, Enterobius, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References


SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli*, *Klebsiella pneumoniae*, *Proteus*, *Salmonella*, *Shigella*, *Pseudomonas*, *Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans*, *Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus*, *Mucor*, *Penicillium*, *Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba*, *Plasmodium*, *Ascaris*, *Taenia*.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT – I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches – rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectorophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Aplications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References

SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- *Entamoeba, Plasmodium, Ascaris, Taenia*
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1) Who is called as "Father of Microbiology"?
   a) Robert Koch   b) Louis Pasteur   c) Antony Von Leewenhock   d) Both b & c
2) Immunity mediated by antibodies are called as ________________
   a) Humoral   b) Cell mediated   c) Active   c) Passive
3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.
4) ___________ is used as a counter stain in spare staining
   a) Safranin   b) Methylene blue  ! c) Malachite green   d) Crystal violet
5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP   b) TDT   c) D   d) None of the above.
6) HEPA filters can remove particles of size ________________
   a) 0.2 um   b) 0.3 um   c) 0.4 um   d) 0.5 um
7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms   b) Anaerobic organisms
   c) Facultative anaerobic organisms   d) Microphilic organisms
8) ___________ is an example for selective media.
   a) Mac conkey agar   b) EMB agar   c) Both a & b   d) None of the above.
9) TVC refers to ____________
   a) Total viable count   b) Total viral count   c) Total viable colony   c) None of the above.
10) ______________ is an example for short term preservation of microbes.
     a) Agar slant   b) Agar slant   c) Mineral oil overlay   d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.
11) a) Discuss the contributions of Lister, Pasteur and Koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe Koch's postulates in detail.
12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.
13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.
14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.
15) a) Discuss about the CO2 liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
    b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
    b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
    b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
    b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
    b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram (b) Similarity matrix (c) Dendrogram (d) None of the above
3. Which of the following is a motile bacterium
   (a) Esherichia coli  (b) Klebsiella  (c) Bacillus subtilis  (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall (b) Colonies have fried egg appearance (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast (b) Plastid (c)Thylakoid (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens (b) Halophiles (c) Thermophiles (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores (b)Zygospores (c) Basidiospores (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores (b) Zygospores (c) Conidiospores (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae (b) Green algae (c) Blue green algae (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall (b) Move by flagella/pseudopodia
    (c) Unicellular (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples
14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of Bergey’s manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Chlorophyta and phaeophyta. Or
   (b) Explain the general characters of sporozoaa with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds
2. Polarly flagellated bacteria is known as --------------
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occurs in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION–C(5X12=60Marks)
Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water (b) Pigments (c) Light (d)H2S

2. *Thiobacillus thiooxidans* is an example of---------
   (a)Chemoautotrophs   (b)Heterotrophs   (c)Photoautotrophs   d)Copiotrophs

3. The organisms which tolerate high pressure are called
   (a) Halotolerant   (b) Barotolerant   (c) Psychrophilic   (d)Thermotolerant

4. Chemostat is associated with
   (a) Synchronous culture   (b)Batch culture   (c) Continous culture   (d)Diauxic growth

5. All the following are intermediates of TCA cycle except
   (a) Citric acid   (b) Fumaric acid (c) Lactic acid (d) ketoglutaric acid

6. The two enzymes ,transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP   (b) ED   (c) HMP   (d)TCA cycle

7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound   (b) Oxygen (c) Nitrogenous compound   (d) Carbondioxide

8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*   (b)*Chlorella sp*   (c) *Klebsiella* sp  (d) *Escherichia coli*

9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water   (b) Sunlight (c)H2S   (d) O2

10. The carrier molecule in cell- wall biosynthesis is a----
    (a) Lipid   (b) Carbohydrate   (c)Protein   (d) None of the above

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.

12. (a) What is synchronous growth?Explain any one method of obtaining synchronous growth. Or
    (b)Give an account on Diauxic growth.

13. (a) Giving suitable example , describe substrate level phosphorylation. Or
    (b) Describe ED pathway.

14. (a)describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.

15. (a)What is anoxygenic photosynthesis ? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - AnswerALLQuestions.

16. (a) With neat diagram , describe the event of endospore formation in bacteria. Or
    (b) With suitable examples , classify bacteria based on their nutritional requirements.

17. (a) Discuss in detail the different phases of growth.. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or  
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or  
(b) Explain the pathway of anaerobic respiration with CO2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or  
(b) Describe the C3 pathway of CO2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.
1. Hot air oven functions based on the principle of  
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by  
   a. lyophilization  b. incineration  c. autoclave  d. oven.
3. Lyophilization is the  
   a. separation of proteins  b. sudden freezing and dehydration  
   c. enzyme reaction by oxidation  d. high pressure–segmentation.
4. The pH is defined as  
   a. logH+  b. log2H+  c. -logH+  d. -log2H+.
5. Which is used as an absorbent in TLC.  
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel.
6. SDS-PAGE is used to separate  
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.
7. UV light is significantly absorbed by  
   a. coloured solution  b. nucleic acid  c. proteins  d. enzymes.
8. NPK analysis is done using  
   a. electrophoresis  b. centrifugation.  c. flame photo  d. chromatography.
9. The pH of the blood is  
   a. 6.3  b. 7.4  c. 7.0  d. 7.6.
10. What is the normality of 5M NaOH solution?

SECTION B (5X6=30Marks) - Answer ALL Questions.
11. a. With a schematic diagram, describe the working of a laminar flow chamber.  
   (or)  
   b. Explain the working of an incubator.
12. a. Explain the electrodes used in pH measurement.  
   (or)  
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13. a. What is paper chromatography?  
   (or)  
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology.
   with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV       b) Retrovirus   c) Pox       d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A       b) B      c) C     d) Z

3) --------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase    b) helicase   c)polymerase    d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad b) Tautam &Lederberg c) Meselson &stahl d) Hershey & Chase

5) -------- no of codons constitute the coding dictionary
   a) 64      b) 61       c) 62      d) 60
6) CAP is involved in-------------?
   a) Catabolic repression  b) Induction  c) feed back inhibition  d) None of these
7) -----------is an example for intercalating agent?
   a) Acridine orange  b) EMS  c) Nitrous oxide  d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair  d) all of the above
9) Davis-u-tube expt is used to prove the existence of--------?
   a) Transformation  b) conjugation  c) transduction  d) recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION--B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA  OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment  OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code  OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test  OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction  OR
    b) Describe Holiday model of recombination

SECTION--C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?  OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli  OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?  OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene  OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as _______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) ________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ________________ is the immunogloutin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitiity is otherwise called as ____________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to _______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ____________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ____________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION – B (5X6 = 30 Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Giva a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C (5X12 = 60 Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

**CORE PAPER VIII - FOOD MICROBIOLOGY**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A (10 x 1= 10 Marks)**

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) amino acids
2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min (b) 62.5°C, 30 min (c) 71.7°C, 15 sec (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus (b) Bacillus (c) Saccharomyces (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather (b) springer (c) flipper (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce (b) yoghurt (c) bread (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides (b) Streptococcus faecalis (c) Pediococcus cerevisiae (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample (b) storage of sample at room temperature for 24 hr (c) gathering information (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

**SECTION – B (5X6=30 Marks) - Answer ALL Questions.**

11a) What is the significance of molds in food microbiology? Describe. (or)
   b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
   b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
   b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
   b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
   b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
   b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
   b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
   b) Discuss the biological spoilage of canned foods.
19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
   b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
   b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI    (b) EcoRI   (c) HindIII   (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase   (b) E.coli ligase   (c) Sal ligase   (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA   (b) Protein   (c) Phosphatase   (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosal   (b) Double stranded   (c) Self replicating   (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid   (b) Phage lambda   (c) M13 Phage   (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage   (b) Plasmid   (c) Plasmid and phage   (d) Fungi.
7. Colony hybridization technique is employed for
   (a) Selection of vector   (b) Unhybridised ones   (c) Selection of desirable clones   (d) None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation   (b) Microinjection   (c) Transformation   (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus   (b) Thermus aquaticus   (c) Thermobacter aquaticus(d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot   (b) Northern blot   (c) Western blot   (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning.  Or  
   (b) Explain the action of Methylases.
12. (a) Write a note on YAC.  Or  
   (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis.  Or  
   (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone?  Or  
   (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique.  Or  
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses.  Or  
   (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library.  Or  
   (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  Or  
   (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or  
   (b) How will you identify the presence of r DNA in a cell?.
20. (a) Explain Southern blotting technique and its applications.  Or  
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II  
RECOMBINANT DNA TECHNOLOGY - II  
Duration – 3hrs  
Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1)  ---------- are broad spectrum antiviral products  
   a) Histones  b)IFN  c) Streptomycin  d) Nystatin
2) Xanthan gum is produced from  
   a) Pseudomonas putida  b) Xanthomonas campestris  c) Xanthococcus  d) Zymomonas
3)  ---------- is involved in the fusion of myloma cells with spleen cells  
   a) PEG  b) PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as ----------  
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) ---------- required for the transfer of the T DNA from A. tumificacience to plant cells  
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is ----------  
   a) Unusual Amino acid b) Nucleotide c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis  
   a) Monkey  b) Snake  c) Dinosaurs  d) Mice
8) Method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c

9) Marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR

10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION – B (5X5=25Marks) - Answer ALL Questions.

11a) Write a brief account on commercial biosynthesis of interferons  (or)
    d) List the uses Human growth hormone and brief on its commercial production

12a) Give a short note on Antidiotype vaccine  (or)
    b) List the uses and application of monoclonal antibodies

13a) Explain in short the application and development of transgenic sheep  (or)
    b) Transgenic mice; DNA microinjection method of development- explain

14a) Explain in short about Ti based cointegrate vectors  (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin

15a) List the scope and application of HGP  (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.

16a) Write an essay on the commercial synthesis of small proteins  (or)
    b) Discuss microbial synthesis of Biopolymers

17a) Discuss the protocol involved in production of Monoclonal Antibodies  (or)
    b) Explain the method and application of gene therapy

18a) Discuss about Microbial insecticides  (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants

19 a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application  (or)
    b) Discuss about transgenic- goat, pig, birds and fish

20a) Write a detailed essay on DNA Fingerprinting and its application  (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation

2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation

3. Steady state is achieved in ______________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a________________
   a. open culture system       b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product       b. Vitamin B12 as a by product
   c. Vitamin C as a by product        d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at --------- stage of their growth.
   a. lag           b. log           c. stationary       d. decline
7. The term single –cell protein was coined at--------- in 1966
   a. CFTRI, Mysore            b. Massachusetts Institute of technology
   c. MTCC                         d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol     b. methane       c. oil       d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control  c. sterilization  d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid       c. both      d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**

11.a. Discuss the significance of microbes in the production of commercially important products.
     (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture   (or)
     b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.   (or)
     b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making   (or)
     b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.   (or)
     b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**

16.a. Give a detailed account on the various methods of strain improvement   (or)
     b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.   (or)
     b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.   (or)
     b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.   (or)
     b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.   (or)
     b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) ---------------- is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an an example for -------------- degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) ---------------- is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as -------- in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability ------------ number of E.coli can present in 100 ml of water
   a) 1  b) 0  c) 10  d) 100

9) Application of alum is in -------- phase of water treatment

10) Super Bug was developed and patented by --------
    a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION – C (5X12=60Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?
   (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) M. Theiler

2. The spikes are otherwise
   (a) Peplomers  (b) Capsid  (c) Envelope  (d) Coat

3. The one step growth experiment was developed by
   (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) Max Delbruck and Emory Ellis

4. Single stranded DNA phage is
   (a) T4 phage  (b) MS2  (c) QB  (d) O X 174

5. The process of release of the prophage from the bacterial DNA is called
   (a) Conduction  (b) Transfection  (c) Insertion  (d) Induction

6. The int gene codes for the synthesis of an
   (a) Integrase  (b) Ligase  (c) Excisionase  (d) Replicase

7. TMV has a Linked transport of two substances in the same direction is called
   (a) Non–infectious ss RNA  (b) Infectious ss RNA
   (c) Non–infectious ss DNA  (d) Infectious ss DNA

8. Plant viruses penetrate the host cells through
   (a) Endodesmata  (b) Pore  (c) Echodesmata  (d) None of the above

9. In Herpes viridae the viral envelope adsorbs to the receptors on
   (a) Plasma membrane  (b) Cytoplasm  (c) Nucleus  (d) None of the above

10. For measles, the immunogen is
    (a) Active but attenuated  (b) Inactive but attenuated  (c) Inactive heat killed  (d) Inactivated

SECTION B (5X6 = 30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region.  Or
    (b) Write a note on viral envelopes and enzymes.

12. (a) Explain the one step growth experiment.  Or
    (b) Give an account on the structure of a typical bacterial virus.

13. (a) Give an account on reproduction of RNA phage.  Or
    (b) Describe lysogenic conversion and its significance.

14. (a) Write a note on penetration and uncoating of viruses in the animal cell.  Or
    (b) Write a note on characteristics of the viruses that infect algae and fungi.

15. (a) Write short notes on AIDS.  Or
    (b) Give a brief outline on Rubella virus.

SECTION C (5X12 = 60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods.  Or
    (b) Give a brief account on the early development of virology.

17. (a) Explain briefly the reproduction of ds DNA T4 phage.  Or
    (b) Give a detailed account on ss DNA phage.

18. (a) Describe the temperate bacteriophages and lysogeny.  Or
    (b) Give a brief account on generation of defective phages and their uses.

19. (a) Explain briefly the reproduction of plant viruses.  Or
    (b) Give a detailed account on viruses and cancer.

20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus.  Or
    (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs
Maximum – 75 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease
   a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called
   a. immune  b. carrier  c. vector  d. resistant
3. The commonest cause of localized supplicative lesion in man is
   a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
4. Toxigenecity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar  b. BSA  c. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces  b. urine  c. sputum  d. blood

SECTION-B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers. (or)  
      b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)  
      b. Give the features of B.anthracis
13.a. Describe the methods for diagnosis to tetanus (or)  
      b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)  
      b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidiae. (or)  
      b. Give the features of Rickettsiae.

SECTION-C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples. (or)  
      b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)  
      b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)  
      b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)  
      b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)  
      b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs  Maximum – 75 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha  b) Mycelium  c) Mould  d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci  b) P. notatum  c) Rhizopus  d) Mucor

3. Candidosis is caused mainly by ____________
   a) C. albicans  b) C. tropicalis  c) C. pseudotropicalis  d) C. krusei

4. The major organism which causes urinary tract infection is ________________
   a) E. coli  b) Salmonella  c) Shigella  d) Klebsiella

5. Traveller's diarrhea is caused by ________________
   a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli  d) Enterotoxigenic E. coli

6. Blue pus is caused by ____________
   a) Pseudomonas  b) Vibrio  c) Salmonella  d) E. Coli

7. Sexually transmitted disease is caused by ____________
   a) Treponema  b) Klebsiella  c) Proteus  d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as ________________
   a) Septicemia  b) bacteremia  c) Viremia  d) Algemia

9. MIC denotes ________________
   a) Maximum inhibitory concentration  b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration  d) None of the above

10. Endoflagella is a characteristic nature present in ____________
    a) Spriochetes  b) Salmonella  c) Proteus  d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium  (or)  b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or)  b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17. a) Describe Trichusis trichura (or)
    b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis  (or)  b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients’ blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of *Mycobacterium tuberculosis*, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION – B(5x6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
   b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
   b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
    b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
    b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
    b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine  b) Mid stream urine  c) Urine form catheter bag  d) Early morning urine sample

2. All the following are acid fast except,
   a) *Mycobacterium*   b) *Actinomycetes*   c) *Nocardia*   d) *Staphylococci*

3. The common medium used for growing *M tuberculosis* is
   a) Blood agar  b) Mac conkey agar  c) Lowenstein Jensen’s medium  d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC+++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Klebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*

5. Selective medium for *Staphylococci* is
   a) EMB agar  b) BSA  c) MSA  d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm

7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (-) negative  b) are “universal recipients” of transfusion  
   c) have circulating anti A and B antibodies  d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None

10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.
11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.
12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.
13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.
14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to moniter infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.
15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.
17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.
18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity.(OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.
19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case?(OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.
20. a) What information is essential for the design of a pathogen specific nucleotide probe?
   Where can one obtain such information? In this information available for all pathogens.(OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica  b) Entamoeba coil  c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs b) Larvae penetrating through the skin
   b)  c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
        c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing.(OR)
   b) Name the specimen collected for dermatophytooses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male?(OR)
   b) Serodiagnosis of parasitic infections — Comment

18 a) Laboratory identification of blood protozoan — *Plasmodium.* (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the **B.Sc., Microbiology** degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology / Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.
      
      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)
      
      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

Group A: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

Group B: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

Group C: application oriented subjects: 2 subjects – 4 papers
The application –oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

Group D: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

Diploma Programme:
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) Co-Curricular activities: NSS/NCC/Physical education
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

   a) A candidate will be permitted to appear for the university examinations for any semester if
      i) He/she secures not less than 75% of attendance in the number of working days during the semester.
      ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and
      iii) His/her conduct has been satisfactory.

      Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

   d) A candidate who has secured less than 65%of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**
   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**
   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**
   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical ) in the University examination shall be declared to have passed the examination in the subject (theory or Practical ).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**
   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**
    a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

    b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

    (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

    (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from the manner prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for Part III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
# SCHEME OF EXAMINATIONS

<table>
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<tr>
<th>Sem</th>
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<th>Subject and Paper</th>
<th>Instruction Hrs per week</th>
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* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_),Capsule staining, Nuclear and Flagella staining- Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, Mclntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora ,Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount – LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I
Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II

UNIT -III

UNIT- IV
Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor-Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V
Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bio luminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT -III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER - V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S., 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V  
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I 

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II 

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III 

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV 

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radioimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V 

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application, -Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics-Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References
SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplasmic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II

Reproduction of DNA phages- ds DNA lytic phages- lytic cycle of T4 phage
The one step growth- adsorption to the host cell and penetration- synthesis of Phage nucleic acids and protein assembly of phage particles- release of phage particles. Example of ss DNA phage- OX 174- circle replication.

UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A.B).
Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References

SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diphtheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydia, Rickettsiae.

References

5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT - I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancroftii, Enterobius, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References
SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli*, *Klebsiella pneumoniae*, *Proteus*, *Salmonella*, *Shigella*, *Pseudomonas*, *Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans*, *Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus*, *Mucor*, *Penicillium*, *Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba*, *Plasmodium*, *Ascaris*, *Taenia*.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches – rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV  
DIPLOMA PAPER II  
DIAGNOSTIC MICROBIOLOGY – I  
(BACTERIOLOGY AND SEROLOGY)

UNIT – I  

UNIT – II  
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II  
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III  
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV  
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V  
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References

SEMESTER V
DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology – Collection and transport of clinical specimens – Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques- McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- Widal
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
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MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs                         Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert Koch  b) Louis Pasteur  c) Antony Von Leewenhock  d) Both b & c

2) Immunity mediated by antibodies are called as ________________
   a) Humoral    b) Cell mediated    c) Active    c) Passive

3) _______ is the ability of a lens to separate or distinguish between small objects that are close together.

4) __________ is used as a counter stain in spare staining
   a) Safranin    b) Methylene blue    c) Malachite green    d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP    b) TDT    c) D    d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um    b) 0.3 um    c) 0.4 um    d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms    b) Anaerobic organisms
   c) Facultative anaerobic organisms    d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar    b) EMB agar    c) Both a & b    d) None of the above.

9) TVC refers to ________________
   a) Total viable count    b) Total viral count    c) Total viable colony    c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant    b) Agar slant    c) Mineral oil overlay    d) a,b & c.

SECTION –B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and Koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe Koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease

17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.

18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.

19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.

20) a) Describe hemocytometer (or)
    b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group

2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram (b) Similarity matrix (c) Dendrogram (d) None of the above

3. Which of the following is a motile bacterium
   (a) Esherichia coli (b) Klebsiella (c) Bacillus subtilis (d) Staphylococcus aureus

4. All the following are true about Mycoplasma except
   (a) Lack cellwall (b) Colonies have fried egg appearance (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes

5. The photosynthetic organelles in bacteria is
   (a) Chloroplast (b) Plastid (c) Thylakoid (d) Pyrenoid

6. Bacteriorhodopsin is present in
   (a) Methanogens (b) Halophiles (c) Thermophiles (d) Purple sulphur bacteria

7. The sexual spores formed by Agaricus is called
   (a) Ascospores (b) Zygosporas (c) Basidiospores (d) Sporangiospores

8. All the following are asexual spores of fungi except
   (a) Sporangiospores (b) Zygosporas (c) Conidiospores (d) Chlamydospores

9. The members of phaeophyta are commonly known as
   (a) Red algae (b) Green algae (c) Blue green algae (d) Brown algae

10. All the following are true about protozoa except
    (a) All members have cellwall (b) Move by flagella/pseudopodia
        (c) Unicellular (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? Explain. 
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. 
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. 
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.
14. (a) Explain the life cycle of Mucor 
   (b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. 
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. 
   (b) Give a detailed account of Bergey's Manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. 
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi. 
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta 
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan 
   (b) Lipopolysaccharide 
   (c) Peptidoglycan + Lipopolysaccharide+ compounds 
   (d) other compounds
2. Polarly flagellated bacteria is known as ---------
   (a) Lophotrichous 
   (b) Peritrichous 
   (c) Atrichous 
   (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane  (b) Mitochondria  
   (c) Polyphosphate granules  (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes  (b) A double membrane structure  
   (c) Communication with cytoplasm  (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  
   (c) M13 Phage  (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport  (b) Facilitated diffusion  (c) Symport  (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells  (b) Prokaryotic cells  
   (c) Both a & b  (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles  (b) Extreme thermophiles  
   (c) Acidophiles  (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage  (b) Ether linkage  
    (c) B 1-4 linkage  (d) Ionic linkage

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**

11. (a) Describe the capsule and slime layer of prokaryotic cell.  Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum.  Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis.  Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion.  Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria.  Or
    (b) What are methanogens? Exemplify the role with examples.

**SECTION–C(5X12=60Marks)
Answer ALL Questions.**

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization.  Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast.  Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell.  Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles.  Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                                                    Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water            (b) Pigments          (c) Light         (d)H2S
2. *Thiobacillus thiooxidans* is an example of--------
   (a)Chemoautotrophs   (b)Heterotrophs     (c)Photoautotrophs (d)Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant     (b) Barotolerant     (c) Psychrophilic    (d)Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture (b)Batch culture (c) Continous culture (d)Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid      (b) Fumaric acid    (c) Lactic acid     (d) ketoglutaric acid
6. The two enzymes,transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP            (b) ED                (c) HMP             (d)TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound (b)Oxygen          (c) Nitrogenous compound (d) Carbondioxide
8. Which of the following carries out mixed acid fermentation?
   (a) Saccharomyces cerevisiae (b)Chlorella sp (c) Klebsiella sp (d) Escherichia coli
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water          (b) Sunlight        (c)H2S             (d) O2
10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid        (b) Carbohydrate   (c)Protein        (d) None of the above

SECTION –B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth?Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.
13. (a) Giving suitable example , describe substrate level phosphorylation. Or
    (b) Describe ED pathway.
14. (a) describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a)What is anoxygenic photosynthesis ? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - AnswerALLQuestions.

16. (a) With neat diagram , describe the event of endospore formation in bacteria. Or
    (b) With suitable examples , classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization   b. moist air sterilization   c. membrane filtr   d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization   b. incineration   c. autoclave   d. oven.
3. Lyophilization is the
   a. separation of proteins   b. sudden freezing and dehydration   c. enzyme reaction by oxidation   d. high pressure–segmentation.
4. The pH is defined as
   a. log H⁺   b. log 2H⁺   c. -log H⁺   d. -log 2H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution   b. lead sulphate   c. anions   d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid   b. lipid   c. protein   d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solution   b. nucleic acid   c. proteins   d. enzymes.
8. NPK analysis is done using
   a. electrophoresis   b. centrifugation   c. flame photo   d. chromatography.
9. The pH of the blood is
   a. 6.3   b. 7.4   c. 7.0   d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION B (5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
   b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)

b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml/g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)

b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge. (or)

b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)

b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)

b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)

b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology.

   with their applications (or)

b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in -------- to prove that the RNA also act as genetic material
   a) TMV  b) Retrovirus  c) Pox  d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A  b) B  c) C  d) Z

3) ---------- Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase  b) helicase  c) polymerase  d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg  c) Meselson &stahl  d) Hershey & Chase

5) ---------- no of codons constitute the coding dictionary
   a) 64  b) 61  c) 62  d) 60
6) CAP is involved in------------?
   a) Catabolic repression  b) Induction c) feed back inhibition  d) None of these
7) ----------is an example for intercalating agent?
   a) Acridine orange  b) EMS  c) Nitrous oxide  d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair d) all of the above
9) Davis-u-tube exp is used to prove the existance of--------?
   a) Transformation  b) conjugation  c) transduction d0 recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA  OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment  OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code  OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test  OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction  OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?  OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli  OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?  OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene  OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII -PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) __________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) __________________ is the immunoglutin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as __________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as __________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ______
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as___________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus.  (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway.  (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction.  (or)
    b) Comment on autoimmune disorders.

14) a) Giva a brief note on RIA  (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system.  (or)
    b) Write a detailed note on the immunologic basis of allograft rejectoin.

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier  (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity.  (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis  (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8C, 30 min (b) 62.5C, 30 min (c) 71.7C, 15 sec (d) 71.7C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus (b) Bacillus (c) Saccharomyces (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather (b) springer (c) flipper (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce (b) yoghurt (c) bread (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides (b) Streptococcus faecalis
   (c) Pediococcus cerevisiae (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample (b) storage of sample at room temperature for 24 hr
   (c) gathering information (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

SECTION B (5X6 = 30 Marks) - Answer ALL Questions.

11a) What is the significance of molds in food microbiology? Describe. (or)
    b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
    b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
    b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
    b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)

b) Give a brief account of food standards.

**SECTION – C (5x12=60 Marks)**

**Answer ALL Questions.**

16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)

b) What are the various factors that influence the growth of microorganisms in foods.

17a) Discuss the use of high temperature in food preservation. (or)

b) Discuss the principles of food preservation.

18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)

b) Discuss the biological spoilage of canned foods.

19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)

b) With neat flow chart describe the production of cheese.

20a) Describe in detail about food borne infections caused by bacteria. (or)

b) What are mycotoxins? Describe in detail with suitable examples.

**APPLICATION ORIENTED PAPER - I**

**Duration – 3hrs**

**Maximum – 75 Marks**

**RECOMBINANT DNA TECHNOLOGY - I**

**SECTION A (10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. GAATTC is the recognition sequence of
   (a) BamHI (b) EcoRI (c) HindIII (d) HaeIII

2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase (b) E.coli ligase (c) Sal ligase (d) All

3. Phosphoramidite method is used for the synthesis of
   (a) DNA (b) Protein (c) Phosphatase (d) Phosphoric acid

4. Plasmids are DNA strands which are
   (a) Extrachromosomal (b) Double stranded (c) Self replicating (d) All the above

5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi.

7. Colony hybridization technique is employed for
   (a) Selection of vector (b) Unhybridised ones (c) Selection of desirable clones (d) None of the above

8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation (b) Microinjection (c) Transformation (d) None

9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus (b) Thermus aquaticus (c) Thermobacter aquaticus (d) Thermus aquaticae

10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot (b) Northern blot (c) Western blot (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or
   (b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or
    (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or
    (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or
    (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or
    (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or
    (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
    (b) How will you identify the presence of r DNA in a cell?.
20. (a) Explain Southern blotting technique and its applications. Or
    (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs
aximum – 75 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) ------------ are broad spectrum antiviral products
   a) Histones   b)IFN   c) Streptomycin   d)Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida   b) Xanthomonas campestris   c)Xanthococcus   d) Zymomonas
3) ------------ is involved in the fusion of myloma cells with spleen cells
   a) PEG   b)PGA   c) IPTG   d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as ------------
   a) Subunit   b) Whole cell   c) Antiidiotype   d) Peptide
5) ----------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes   b) Right border   c) Left border   d) IAA
6) Nopaline is ------------
   a) Unusual Amino acid   b) Nucleotide   c) Vitamin   d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey   b) Snake   c)Dinosaur   d) Mice
8) ------------ method is involved development of transgenic animal
   a) Microinjection   b) Protoplast fusion   c) Hybridoma technology   d) b and c
9) -------------- marker are involved in DNA Fingerprinting
   a) VNTR   b) RFLP   c) RAPD   d) STR3
10) Father of HGP
    a) Francis Collins   b) Venter   c) James Watson   d) Hunkapillar

SECTION –B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons   (or)
    d)  List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine   (or)
    b)  List the uses and application of monoclonal antibodies
13a) Explain in short the application and development of transgenic sheep   (or)
    b)  Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors   (or)
    b)  Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP   (or)
    b)  What is Bioremediation? How does r DNA technology influences it?

SECTION –C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins   (or)
    b)  Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies   (or)
    b)  Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides   (or)
    b)  Elucidate methods involved in generation of insect, virus, resistant plants
19a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application   (or)
    b)  Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application   (or)
    b)  Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1.  Erlenmeyer flasks are used in fermentation process during
   a. secondary screening   b. strain improvement   c. pilot scale   d. commercial operation
2.  Glutamic acid is used for
   a. feed supplement b. flavour enhancer c. ethanol production d. antibiotic fermentation
3.  Steady state is achieved in ____________ fermentation.
   a. batch   b. fed-batch   c. continuous   d. all
4. Batch culture is a _______________
   a. open culture system  b. system that maintains constant cell conc.
   c. system with addition of nutrients  d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product  b. Vitamin B12 as a by product
   c. Vitamin C as a by product  d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag  b. log  c. stationary  d. decline
7. The term single –cell protein was coined at--------- in 1966
   a. CFTRI, Mysore  b. Massachusetts Institute of technology
   c. MTCC  d. Imperial chemical Industries.
8. ___________ was at one time the most important substrate for SCP production
   a. methanol  b. methane  c. oil  d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery  b. quality control  c. sterilization  d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid  b. amino acid  c. both  d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**
11.a. Discuss the significance of microbes in the production of commercially important products. (or)
    b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture (or)
    b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production. (or)
    b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making (or)
    b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods. (or)
    b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**
16.a. Give a detailed account on the various methods of strain improvement (or)
    b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor. (or)
    b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production. (or)
    b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast. (or)
    b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples. (or)
    b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism b) Commensalism c) Parasitism d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism b) Commensalism c) Parasitism d) Symbiosis

3) --------------- is an example of recalcitrant compound
   a) Lignin b) Protein c) Carbohydrate d) Lipid

4) Fermentation is an example for -------------- degradation
   a) Aerobic b) Anaerobic c) a and b d) None of the above

5) -------------- is a cellulolytic bacteria
   a) Pseudomonas b) Klebsiella c) Mycoplasma d) Zymomonas

6) Rhizobium exist as ---------------- in the nodules
   a) Protoplast b) Bacterioides c) Mycoplasma d) None of the above

7) Azospirillum is an example for
   a) Free living b) Symbiotic c) associative d) all the above

8) According to the American standard of potability -------------- number of E.coli
   can present in 100 ml of water a) 1 b)0 c)10 d) 100

9) Application of alum is in -------- phase of water treatment

10) Super Bug was developed and patented by ----------
    a) Khorana b) Kohnberg c) Chakraborthy d) Sanger

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV? (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) M. Theiler
2. The spikes are otherwise (a) Peplomers (b) Capsid (c) Envelope (d) Coat
3. The one step growth experiment was developed by (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is (a) T4 phage (b) MS2 (c) QB (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called (a) Conduction (b) Transfection (c) Insertion (d) Induction
6. The int gene codes for the synthesis of an ------------ enzyme (a) Integrase (b) Ligase (c) Excisionase (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA (b) Infectious ss RNA (c) Non – infectious ss DNA (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through (a) Endodesmata (b) Pore (c) Echodesmata (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane (b) Cytoplasm (c) Nucleus (d) None of the above
10. For measles, the immunogen is (a) Active but attenuated (b) Inactive but attenuated (c) Inactive heat killed (d) Inactivated

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or (b) Give a brief outline on Rubella virus.

SECTION – C (5X12=60Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs                        Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called a. immuned  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
5. Spot the Gram positive anaerobic endospore forming bacillus a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae a. SS agar  b. BSA  c. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is a. faeces  b. urine  c. sputum  d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers.  (or)
      b. State Koch postulates.
12.a. Give the features of Streptococcus.  (or)
      b. Give the features of B.anthracs
13.a. Describe the methods for diagnosis of tetanus  (or)
      b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever.  (or)
      b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidiae.  (or)
      b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples.  (or)
      b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same?  (or)
      b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani.  (or)
      b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli.  (or)
      b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum.  (or)
      b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs  Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha    b) Mycelium    c) Mould    d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci    b) P. notatum    c) Rhizopus    d) Mucor

3. Candidosis is caused mainly by ________________
   a) C. albicans    b) C. tropicalis    c) C. pseudotropicalis    d) C. krusei

4. The major organism which causes urinary tract infection is ________________
   a) E. coli    b) Salmonella    c) Shigella    d) Klebsiella

5. Traveller's diarrhea is caused by ________________
   a) Enteropathogenic E. coli    b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli    d) Enterotoxigenic E. coli

6. Blue pus is caused by ________
   a) Pseudomonas    b) Vibrio    c) Salmonella    d) E. Coli

7. Sexually transmitted disease is caused by ________________
   a) Treponema    b) Klebsiella    c) Proteus    d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as___________
   a) Septicemia    b) bacteraemia    c) Viremia    d) Algemia

9. MIC denotes ________________
   a) Maximum inhibitory concentration    b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration    d) None of the above

10. Endoflagella is a characteristic nature present in ________________
    a) Spirochetes    b) Salmonella    c) Proteus    d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium   (or)   b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or)   b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance   (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17. a) Describe Trichusis trichura   (or)
    b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis   (or)   b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium  b) Glycerol saline medium  c) Cary Blair medium  d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne  b) Ingestion  c) Direct inoculation  d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True  b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid  b) Blood  c) Semen  d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol  b) Sputolysin  c) Sputasol  d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol  b) Sodium hypochlorite  c) 2% Glutaraldehyde  d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium  b) Cooked meat medium  c) Saponin broth  d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA  b) ELISA  c) Western blot  d) PCR

10. For detection of *Mycobacterium tuberculosis*, the most sensitive and rapid method is
    a) Culturing on LJ medium  b) Acid fast staining  c) Animal susceptibility  d) Fluorescent Microscopy.

SECTION B (5X6 = 30 Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. a) List the Universal Precautions.(OR)
b) Describe the procedures used for culturing anaerobic microorganisms.
17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.
18. a) Comment on the biological safety cabinets in a Microbiology laboratory.(OR)
b) How can individual pathogenic viruses be identified in the lab.
19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.
20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens?(OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY
Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample
2. All the following are acid fast except,
   a) *Mycobacterium*   b) *Actinomycetes*    c) *Nocardia*    d) *Staphylococci*
3. The common medium used for growing *M tuberculosis* is
   a) Blood agar b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC++--- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*   b) *Klebsiella pneumoniae*    c) *Proteus vulgaris*    d) *Pseudomonas aeruginosa*
5. Selective medium for *Staphylococci* is a) EMB agar b) BSA c) MSA d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm b) 24mm c) 28mm d) 30mm
7. VDRL is an example for
   a) Agglutination   b) Precipitation   c) Complement fixation test   d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh (D) - negative   b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies   d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen   b) Antibody   c) Antigen and Antibody   d) None
10. Blotting of DNA is called
    a) Western blot   b) Southern blot   c) Northern blot   d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.
11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.
12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.
13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.
14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.
15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.
17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.
18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.
19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.
20. a) What information is essential for the design of a pathogen specific nucleotide probe? Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs   Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon    b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica  b) Entamoeba coil  c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs.  b) Larvae penetrating through the skin
   b)  c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing
    another resident from feeding the flocks of pigeons that regularly visited the area.
    Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces.(OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics.(OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about
    what can be done to relieve symptoms of a viral infections and recover most quickly.(OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture.(OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
    b) Name the specimen collected for dermatophytoses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
    b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium*. (OR)
    b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
    b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
    b) Immunofluorescence — a technique to detect viral infections — Explain.
REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and
COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY
with Semester System
(with effect from 2007-2008)

1. Eligibility for Admission to the Course
   Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. Duration of the Course
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. Course of Study
   The course of study for the UG degree courses of all branches shall consist of the following

   a) Part - I
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) Part – II : English
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) Foundation Course
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) **Part – III**

**Group A:** Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

**Group B:** allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C:** application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D:** field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

- A-Exemplary
- B-very good
- C-good
- D-fair
- E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

a) A candidate will be permitted to appear for the university examinations for any semester if
   i) He/she secures not less than 75% of attendance in the number of working days during the semester.
   ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and
   iii) His/her conduct has been satisfactory.

Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical ) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

(ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

(iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an
      institution approved by/affiliated to the University or has been exempted from in the manner
      prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a
       certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as
c       evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the
   first attempt, within the minimum period prescribed for the course of study from the date of
   admission to the course and secures I or II class shall be eligible for ranking and such ranking
   will be confined to 10% of the total number of candidates qualified in that particular branch of
   study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical
   shall be permitted to do so and such candidate shall join a college in the III year of the course
   and he/she will be permitted to appear for par III alone by granting exemption form appearing
   Part I, Part II and common allied subjects (if any), already passed by the candidate. And a
   candidate desirous to obtain an additional UG degree involving practical shall be [permitted to
   do so and such candidate shall join a college in the II year of the course and he/she be permitted
   to appear for Part III alone by granting exemption form appearing for Part I, Part II and the
   common allied subjects. If any, already passed. Such candidates should obtain exemption from
   the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective
   courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each
   paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change
   for a minimum period of three years from the date of approval of the Regulations. The
   University may revise/amend/change the Regulations and Scheme of Examinations, if found
   necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will
   be permitted to take the Examinations under those Regulations for a period of four years i.e. up
to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the
Examination only under the Regulations in force at that time.
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* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique-- Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – Mcintosh fields jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER – IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High speed, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT – III


UNIT – IV


UNIT – V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GRADE CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER - V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment - mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping , genetic recombination.

References
2. Freifelder, S., 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER - V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References

SEMESTER – V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application,- Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I
Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II
Vaccines – subunit vaccines–Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III
Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV

UNIT -V
DNA finger printing and its Application.

Human Genome Project and History and its Application , Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplasmic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References

SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT-I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A.B). Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References

SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diphtheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.

UNIT -V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydia, Rickettsiae.

References

5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II

MEDICAL MICROBIOLOGY - II

UNIT - I
Mycology: superficial infections- Dermatophytes- Microsporum – Trichophyton, 
Epidermophyton- Madura mycosis- Opportunistic fungal infections- Candida 
Albicans, Aspergillus, Mucor.

UNIT - II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, 
Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT - III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown 
Origin meningitis, diarrhea, respiratory tract infections.

UNIT - IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted 
diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin 
typing.

UNIT - V
Antibiotics and chemotherapeutic agents- Mechanism of actions – Drug 
resistance – Antimicrobial susceptibility testing- Disc diffusion- Kirby Bauer 
method.

References
Orient Longman.
Moshby Publications.
Brothers Medical Publishers (P) Ltd.
SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus and Streptococcus pyogenes.*
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia.*
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunelectorophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture– Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs                                                        Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert koch    b) Louis Pasteur    c) Antony Von Leewenhock    d) Both b & c

2) Immunity mediated by antibodies are called as ________________
   a) Humoral    b) Cell mediated    c) Active    c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) ____________ is used as a counter stain in spare staining
   a) Safranin    b) Methylene blue    c) Malachite green    d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP    b) TDT    c) D    d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um    b) 0.3 um    c) 0.4 um    d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms    b) Anaerobic organisms    c) Facultative anaerobic organisms    d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar    b) EMB agar    c) Both a & b    d) None of the above.

9) TVC refers to ________________
   a) Total viable count    b) Total viral count    c) Total viable colony    c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant    b) Agar slant    c) Mineral oil overlay    d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain  (b) Genus  (c) Species  (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram  (b) Similarity matrix  (c) Dendrogram  (d) None of the above
3. Which of the following is a motile bacterium
   (a) Escherichia coli  (b) Klebsiella  (c) Bacillus subtilis  (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cell wall  (b) Colonies have fried egg appearance  (c) Require sterols for growth
      (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast  (b) Plastid  (c) Thylakoid  (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens  (b) Halophiles  (c) Thermophiles  (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores  (b) Zygosporae  (c) Basidiospores  (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores  (b) Zygosporae  (c) Conidiospores  (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae  (b) Green algae  (c) Blue green algae  (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cell wall  (b) Move by flagella/pseudopodia
        (c) Unicellular  (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples
14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of bergeys manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta .Or
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds
2. Polarity flagellated bacteria is known as
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occurs in eukaryotes?
   (a) Cytoplasmic membrane  (b) Mitochondria  
   (c) Polyphosphate granules  (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes  (b) A double membrane structure  
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  
   (c) M13 Phage  (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport  (b) Facilitated diffusion  (c) Symport  (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells  (b) Prokaryotic cells  (c) Both a & b  (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles  (b) Extreme thermophiles  (c) Acidophiles  (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage  (b) Ether linkage  (c) B 1-4 linkage  (d) Ionic linkage

SECTION – B (5X6=30Marks) - Answer ALL Questions.
11. (a) Describe the capsule and slime layer of prokaryotic cell.  Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum.  Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis.  Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion.  Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria.  Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION – C (5X12=60Marks)
Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization.  Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast.  Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell.  Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles.  Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                                              Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water  (b) Pigments  (c) Light  (d) H2S

2. *Thiobacillus thiooxidans* is an example of---------
   (a) Chemoautotrophs  (b) Heterotrophs  (c) Photoautotrophs  (d) Copiotrophs

3. The organisms which tolerate high pressure are called
   (a) Halotolerant  (b) Barotolerant  (c) Psychrophilic  (d) Thermotolerant

4. Chemostat is associated with
   (a) Synchronous culture  (b) Batch culture  (c) Continuous culture  (d) Diauxic growth

5. All the following are intermediates of TCA cycle except
   (a) Citric acid  (b) Fumaric acid  (c) Lactic acid  (d) Ketoglutaric acid

6. The two enzymes, transketolase and transaldolase are unique to which of the following pathways?
   (a) EMP  (b) ED  (c) HMP  (d) TCA cycle

7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound  (b) Oxygen  (c) Nitrogenous compound  (d) Carbon dioxide

8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*  (b) *Chlorella* sp  (c) *Klebsiella* sp  (d) *Escherichia coli*

9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water  (b) Sunlight  (c) H2S  (d) O2

10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid  (b) Carbohydrate  (c) Protein  (d) None of the above

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11. (a) Give an account on chemoheterotrophic bacteria.  Or
    (b) What are copiotrophs? Describe with suitable examples.

12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth.  Or
    (b) Give an account on Diauxic growth.

13. (a) Giving suitable example, describe substrate level phosphorylation.  Or
    (b) Describe ED pathway.

14. (a) Describe alcoholic fermentation.  Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.

15. (a) What is anoxygenic photosynthesis? Describe.  Or
    (b) Give a brief note on Bioluminescence.

SECTION – C (5X12=60 Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria.  Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.

17. (a) Discuss in detail the different phases of growth.  Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization  b. incineration  c. autoclave  d. oven.
3. Lyophilization is the
   a. separation of proteins  b. sudden freezing and dehydration  c. enzyme reaction by oxidation  d. high pressure–segmentation.
4. The pH is defined as
   a. logH⁺  b. log2H⁺  c. -logH⁺  d. -log2H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solution  b. nucleic acid  c. proteins  d. enzymes.
8. NPK analysis is done using
   a. electrophoresis  b. centrifugation.  c. flame photo  d. chromatography.
9. The pH of the blood is
   a. 6.3  b. 7.4  c. 7.0  d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION – B (5X6=30 Marks) - Answer ALL Questions.
11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
   b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
   b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
   b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**

16.a. Discuss the principle, types and applications of centrifuge. (or)
   b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
   b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
   b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
   b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology. with their applications (or)
   b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

**CORE PAPER VI - MICROBIAL GENETICS**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A ( 10 x 1= 10 Marks)**

1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV   b) Retrovirus   c) Pox   d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A   b) B   c) C   d) Z

3) ----------Enzyme resolves the super coiling during replication of *E.Coli*
   a) gyrase   b) helicase   c) polymerase   d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad   b) Tautam &Lederberg   c) Meselson &stahl   d) Hershey & Chase

5) ---------- no of codons constitute the coding dictionary
   a) 64   b) 61   c) 62   d) 60
6) CAP is involved in----------?
   a) Catabolic repression  b) Induction  c) feed back inhibition  d) None of these
7) ----------is an example for intercalating agent?
   a) Acridine orange  b) EMS  c) Nitrous oxide  d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair  d) all of the above
9) Davis-u-tube exp is used to prove the existance of--------?
   a) Transformation  b) conjugation  c) transduction  d) recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11) a) Elucidate the structure of DNA  OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment  OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code  OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test  OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction  OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?  OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli  OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?  OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene  OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) ___________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ____________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to _______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ______
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as __________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as _________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus.  (or)  
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway.  (or)  
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction.  (or)  
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA  (or)  
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system.  (or)  
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier  (or)  
    b) Define and describe MALT.

17) a) Describe the types of immunity.  (or)  
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis  (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

**CORE PAPER VIII - FOOD MICROBIOLOGY**

**Duration – 3hrs**

Maximum – 100 Marks

**SECTION A (10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min (b) 62.5°C, 30 min (c) 71.7°C, 15 sec (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus (b) Bacillus (c) Saccharomyces (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather (b) springer (c) flipper (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce (b) yoghurt (c) bread (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides (b) Streptococcus faecalis (c) Pediococcus cerevisiae (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample (b) storage of sample at room temperature for 24 hr (c) gathering information (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

**SECTION B (5X6=30 Marks) - Answer ALL Questions.**

11a) What is the significance of molds in food microbiology? Describe. (or)
   b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
   b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
   b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
   b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION – C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.
19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI    (b) EcoRI   (c) HindIII   (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase    (b) E.coli ligase   (c) Sal ligase   (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA     (b) Protein    (c) Phosphatase   (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosomal    (b) Double stranded   (c) Self replicating   (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid    (b) Phage lambda    (c) M13 Phage   (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage    (b) Plasmid    (c) Plasmid and phage   (d) Fungi.
7. Colony hybridization technique is employed for
   (a) Selection of vector    (b) Unhybridised ones   (c) Selection of desirable clones   (d) None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation    (b) Microinjection   (c) Transformation   (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus    (b) Thermus aquaticus   (c) Thermobacter aquaticus(d) Thermus aquatica
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot    (b) Northern blot   (c) Western blot   (d) Eastern blot
SECTION – B (5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning.  
   (b) Explain the action of Methylases.
12. (a) Write a note on YAC.  
   (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis.  
   (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone?  
   (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique.  
   (b) Give an account on RAPD.

SECTION – C (5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses.  
   (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library.  
   (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  
   (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques.  
   (b) How will you identify the presence of r DNA in a cell?
20. (a) Explain Southern blotting technique and its applications.  
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs  
aximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) --------- are broad spectrum antiviral products  
   a) Histones  b) IFN  c) Streptomycin  d) Nystatin
2) Xanthan gum is produced from  
   a) Pseudomonas putida  b) Xanthomonas campestris  c) Xanthococcus  d) Zymomonas
3) --------- is involved in the fusion of myloma cells with spleen cells  
   a) PEG  b) PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as ---------  
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) --------- required for the transfer of the T DNA from A. tumifacience to plant cells  
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is ---------  
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis  
   a) Monkey  b) Snake  c) Dinosaurs  d) Mice
8) -------- method is involved development of transgenic animal
   a) Microinjection   b) Protoplast fusion   c) Hybridoma technology   d) b and c
9) -------- marker are involved in DNA Fingerprinting
   a) VNTR   b) RFLP   c) RAPD   d) STR
10) Father of HGP
    a) Francis Collins b) Venter c) James Watson d) Hunkapillar

SECTION – B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
    d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application ad development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening   b. strain improvement   c. pilot scale   d. commercial operation
2. Glutamic acid is used for
   a. feed supplement b. flavour enhancer   c. ethanol production   d. antibiotic fermentation
3. Steady state is achieved in ______________ fermentation.
   a. batch   b. fed-batch   c. continuous   d. all
4. Batch culture is a________________
   a. open culture system   b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. log   b. lag   c. stationary   d. decline
7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore   b. Massachusetts Institute of technology
   c. MTCC   d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control   c. sterilization   d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid   c. both   d. none

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. Discuss the significance of microbes in the production of commercially important products.
    (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture   (or)
    b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.   (or)
    b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making   (or)
    b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.   (or)
    b. Write short notes on batch filters that are employed in down streaming processing.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Give a detailed account on the various methods of strain improvement   (or)
    b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.   (or)
    b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.   (or)
    b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.   (or)
    b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.   (or)
    b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is a) Ammensalism b) Commensalism c) Parasitism d) Synergism

2) Mycorhizal association is an example of a) Ammensalism b) Commensalism c) Parasitism d) Symbiosis

3) -------------- is an example of recalcitrant compound a) Lignin b) Protein c) Carbohydrate d) Lipid

4) Fermentation is an an example for ----------- degradation a) Aerobic b) Anaerobic c) a and b d) None of the above

5) -------------- is a cellulolytic bacteria a) Pseudomonas b) Klebsiella c) Mycoplasma d) Zymomonas

6) Rhizobium exist as ----------- in the nodules a) Protoplast b) Bacterioides c) Mycoplasma d) None of the above

7) Azospirillum is an example for a) Free living b) Symbiotic c) associative d) all the above

8) According to the American standard of potability ---------- number of E.coli can present in 100 ml of water a) 1 b) 0 c) 10 d) 100

9) Application of alum is in -------- phase of water treatment

10) Super Bug was developed and patented by -------- a) Khorana b) Kohnberg c) Chakraborthy d) Sanger

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
       b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
       b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
       b) Explain carbon cycle

14a) Discuss MPN technique (or)
       b) Explain Eutrophication

15a) Describe Air pollution (or)
       b) Explain the methodology involved in Microbiological Air quality

SECTION – C (5X12=60 Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
       b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
       b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
       b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
       b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
       b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY
Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Who discovered the TMV? (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) M. Theiler
2. The spikes are otherwise (a) Peplomers (b) Capsid (c) Envelope (d) Coat
3. The one step growth experiment was developed by (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is (a) T4 phage (b) MS2 (c) QB (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called (a) Conduction (b) Transfection (c) Insertion (d) Induction
6. The int gene codes for the synthesis of an -------- enzyme (a) Integrase (b) Ligase (c) Excisionase (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA (b) Infectious ss RNA (c) Non – infectious ss DNA (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through (a) Endodesmata (b) Pore (c) Echodesmata (d) None of the above
9. In Herpes viridae the viral envelope adsors to the receptors on (a) Plasma membrane (b) cytoplasm (c) Nucleus (d) None of the above
10. For measles, the immunogen is (a) Active but attenuated (b) Inactive but attenuated (c) Inactive heat killed (d) Inactivated

SECTION–B(5X6=30 Marks) - Answer ALL Questions.
11. (a) Give an account on cultivation of viruses in egg yolk region. Or (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or (b) Give a brief outline on Rubella virus.

SECTION–C(5X12=60 Marks) - Answer ALL Questions.
16. (a) Give a detailed account on viral purification and assay methods. Or (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease
   a. Malaria b. filariasis c. plaque d. all the above
2. Persons with symptomless infection is called
   a. immuned b. carrier c. vector d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococci b. staphylococci c. Pseudomonas d. Vibrio
4. Toxigenecity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus b. Corynebacterium c. Clostridium d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease b. lock jaw c. hepatitis d. rabies
7. Food borne intoxication is caused by a. Salmonella b. E.coli c. Shigell d. Staphylococcus
8. Darting motility is seen with a. E.coli b. Streptococcus c. V.cholerae d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar b. BSA c. LJ d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces b. urine c. sputum d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.
11.a. Define and differentiate carriers. (or)
    b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)
    b. Give the features of B.anthracs
13.a. Describe the methods for diagnosis to tetanus (or)
    b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)
    b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidia. (or)
    b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16.a. Elucidate the methods of transmission of infection with examples. (or)
    b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
    b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha    b) Mycelium    c) Mould    d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffei    b) P. notatum    c) Rhizopus    d) Mucor

3. Candidosis is caused mainly by ________________
   a) C. albicans    b) C. tropicalis    c) C. pseudotropicalis    d) C. krusei

4. The major organism which causes urinary tract infection is ________________
   a) E. coli    b) Salmonella    c) Shigella    d) Klebsiella

5. Traveller's diarrhea is caused by ________________
   a) Enteropathogenic E. coli    b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli    d) Enterotoxigenic E.coli

6. Blue pus is caused by ________ a) Pseudomonas    b) Vibrio    c) Salmonella    d) E. Coli

7. Sexually transmitted disease is caused by ________________
   a) Treponema    b) Klebsiella    c) Proteus    d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as______________
   a) Septicemia    b) bacteremia    c) Viremia    d) Algemia

9. MIC denotes ________________
   a) Maximum inhibitory concentration    b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration    d) None of the above

10. Endoflagella is a characteristic nature present in ________________
    a) Spriochetes    b) Salmonella    c) Proteus    d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium    (or)    b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or)    b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17. a) Describe Trichusis trichura (or)
    b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrheogenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis (or)    b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs 
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients’ blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium 
   b) Glycerol saline medium 
   c) Cary Blair medium 
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne 
   b) Ingestion 
   c) Direct inoculation 
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True 
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid 
   b) Blood 
   c) Semen 
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol 
   b) Sputolysin 
   c) Sputasol 
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol 
   b) Sodium hypochlorite 
   c) 2% Glutaraldehyde 
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium 
   b) Cooked meat medium 
   c) Saponin broth 
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA 
   b) ELISA 
   c) Western blot 
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium 
    b) Acid fast staining 
    c) Animal susceptibility 
    d) Fluorescent Microscopy.

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby – Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. a) List the Universal Precautions.(OR)
b) Describe the procedures used for culturing anaerobic microorganisms.
17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.
18. a) Comment on the biological safety cabinets in a Microbiology laboratory.(OR)
b) How can individual pathogenic viruses be identified in the lab.
19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.
20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens?(OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY
Duration – 3hrs Maximum – 100 Marks

SELECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample
2. All the following are acid fast except,
   a) *Mycobacterium* b) *Actinomycetes* c) *Nocardia* d) *Staphylococci*
3. The common medium used for growing *M tuberculosis* is
   a) Blood agar b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC+++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli* b) *Kiebsiella pneumoniae* c) *Proteus vulgaris* d) *Pseudomonas aeruginosa*
5. Selective medium for *Staphylococci* is a) EMB agar b) BSA c) MSA d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm b) 24mm c) 28mm d) 30mm
7. VDRL is an example for
   a) Agglutination b) Precipitation c) Complement fixation test d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh (D) - negative b) are “universal recipients” of transfusion
c) have circulating anti A and B antibodies d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen b) Antibody c) Antigen and Antibody d) None
10. Blotting of DNA is called
    a) Western blot b) Southern blot c) Northern blot d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe?
    Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Growth medium for fungus inhibits growth of
   a) Bacteria     b) Protozoa    c) Virus    d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus    b) Candida    c) Saccharomyces   d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon   b) Trophozoites and cyst are found in duodenum
c) CFT is diagnostic   d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium    b) Taenia saginata    c) Taenia corporis    d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica b) Entamoeba coil c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs. b) Larvae penetrating through the skin
   b) c) Ingestion of larvae    d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar   b) Cell culture    c) Corn meal agar    d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA    b) IHA    c) Immunoelectrophoresis    d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg b) HBsAg + HBcAg c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil   b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
     b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
     b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
     b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
     b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
     b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
    b) Name the specimen collected for dennatophytozes. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
    b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium*. (OR)
    b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
    b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
    b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**

   Candidate for admission to the first year of the **B.Sc., Microbiology** degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology / Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**

   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**

   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**

      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**

      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**

      The Foundation course shall comprise of two stages as follows:
      - Foundation Course A : General Awareness (I & II semesters)
      - Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.

      | From the printed material supplied by the University | 75% |
      | Current affairs & who is who? | 25% |
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A:** Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester.

**Group B:** allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C:** application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D:** field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) Co-Curricular activities: NSS/NCC/Physical education
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

   a) A candidate will be permitted to appear for the university examinations for any semester if

   i) He/she secures not less than 75% of attendance in the number of working days during the semester.

   ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and

   iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

(ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

(iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an
      institution approved by/affiliated to the University or has been exempted from in the manner
      prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a
       certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as
c       evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the
   first attempt, within the minimum period prescribed for the course of study from the date of
   admission to the course and secures I or II class shall be eligible for ranking and such ranking
   will be confined to 10 % of the total number of candidates qualified in that particular branch of
   study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical
   shall be permitted to do so and such candidate shall join a college in the III year of the course
   and he/she will be permitted to appear for par III alone by granting exemption form appearing
   Part I, Part II and common allied subjects (if any), already passed by the candidate. And a
   candidate desirous to obtain an additional UG degree involving practical shall be permitted to
   do so and such candidate shall join a college in the II year of the course and he/she be permitted
   to appear for Part III alone by granting exemption form appearing for Part I, Part II and the
   common allied subjects. If any, already passed. Such candidates should obtain exemption from
   the university by paying a fee of Rs.500/-.

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective
   courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each
   paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change
   for a minimum period of three years from the date of approval of the Regulations. The
   University may revise/amend/change the Regulations and Scheme of Examinations, if found
   necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will
   be permitted to take the Examinations under those Regulations for a period of four years i.e. up
to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the
Examination only under the Regulations in force at that time.
### SCHEME OF EXAMINATIONS

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* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_),Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique-- Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour,Spread, Streak and Micromanipulator.

UNIT – V

References
SEMMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II
Taxanomy of Eubacteria and Actinomycetes – Detailed classification upto genus level with general characters of each group – Bergey’s Manual and its importance.

UNIT – III
Taxanomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxanomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount – LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor-Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High speed, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT – III


UNIT – IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA—the genetic material, RNA—the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA—replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping , genetic recombination.

References
2. Freifelder , S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER – V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR , Blotting (Southern, Western, Northen) Techniques, RFLP and Application, RAPD and Application, Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - II

UNIT –I

Microbial synthesis of commercial products- Proteins- Pharmaceuticals – Interferons - Human growth hormone- Antibiotics- Biopolymers.

UNIT –II

Vaccines – subunit vaccines – Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants- Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT -IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT - I


UNIT- II


UNIT-III


UNIT - IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V


References
SEMMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of
epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis,
Corynebacterium diptheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive
Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative
organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella,
Pseudomonas, Vibrio cholerae.

UNIT -V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium
Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira,
Chlamydias, Rickettsiae.

References
1. Mackie and Mc catney, 1994, Medical Microbiology No I and II. Churchill
Livingston, 14th edition.
Longman.
Calcutta.
Mosby Publications.
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange
Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT- I

UNIT -II

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- *Staphylococcus* and *Pseudomonas*: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References
SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli*, *Klebsiella pneumoniae*, *Proteus*, *Salmonella*, *Shigella*, *Pseudomonas*, *Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans*, *Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus*, *Mucor*, *Penicillium*, *Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba*, *Plasmodium*, *Ascaris*, *Taenia*.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology – Collection and transport of clinical specimens – Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination -Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunoelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- *Entamoeba, Plasmodium, Ascaris, Taenia*
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs  Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert Koch  b) Louis Pasteur  c) Antony Von Leeuwenhoek  d) Both b & c

2) Immunity mediated by antibodies are called as _______________
   a) Humoral  b) Cell mediated  c) Active  c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) ____________ is used as a counter stain in spare staining
   a) Safranin  b) Methylene blue  c) Malachite green  d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP  b) TDT  c) D  d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um  b) 0.3 um  c) 0.4 um  d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms  b) Anaerobic organisms  c) Facultative anaerobic organisms  d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar  b) EMB agar  c) Both a & b  d) None of the above.

9) TVC refers to ____________
   a) Total viable count  b) Total viral count  c) Total viable colony  c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant  b) Agar slant  c) Mineral oil overlay  d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theroy of disease and to the treatment or prevention of diseases.  (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope  (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave.  (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques.  (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes.  (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
    b) Describe germ theory of disease

17) a) Write the principle and application of bright field microscope (or)
    b) Describe gram staining.

18) a) List out the chemical methods of sterilization in detail. (or)
    b) Describe filtration and its types.

19) a) Discuss the types of media with eg. for each. (or)
    b) Explain in detail about selective and differential media.

20) a) Describe hemocytometer (or)
    b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group

2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram (b) Similarity matrix (c) Dendrogram (d) None of the above

3. Which of the following is a motile bacterium
   (a) *Escherichia coli* (b) *Klebsiella* (c) *Bacillus subtilis* (d) *Staphylococcus aureus*

4. All the following are true about Mycoplasma except
   (a) Lack cellwall (b) Colonies have fried egg appearance (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes

5. The photosynthetic organelles in bacteria is
   (a) Chloroplast (b) Plastid (c) Thylakoid (d) Pyrenoid

6. Bacteriorhodopsin is present in
   (a) Methanogens (b) Halophiles (c) Thermophiles (d) Purple sulphur bacteria

7. The sexual spores formed by *Agaricus* is called
   (a) Ascospores (b) Zygosporue (c) Basidiospores (d) Sporangiospores

8. All the following are asexual spores of fungi except
   (a) Sporangiospores (b) Zygosporue (c) Conidiospores (d) Chlamydospores

9. The members of phaeophyta are commonly known as
   (a) Red algae (b) Green algae (c) Blue green algae (d) Brown algae

10. All the following are true about protozoa except
    (a) All members have cellwall (b) Move by flagella/pseudopodia
    (c) Unicellular (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) What is serotaxonomy? explain. Or
(b) Describe any two important characteristics used in serotaxonomy.

12. (a) Give distinguishing characters of clostridium. Or
(b) State the important features and significance of enterobacteria.

13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
(b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.

14. (a) Explain the life cycle of Mucor Or
(b) Describe briefly the life cycle of Dictyostelium

15. (a) Give a brief account of pseudopodia. Or
(b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
(b) List out and describe the genetic characters used in taxonomy.

17. (a) What are the general characteristics of actinomycetes? Describe. Or
(b) Give a detailed account of Bergeys manual and its importance.

18. (a) Summarise the major characteristics of archaebacteria. Or
(b) Classify the photosynthetic eubacteria listing out their important features with suitable examples

19. (a) Discuss in detail the general characteristics of fungi. Or
(b) With neat diagram describe the life cycle of Agaricus.

20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or
(b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds

2. Polarly flagellated bacteria is known as 
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

SECTION-B(5X6=30Marks) - Answer ALL Questions.
11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION-C(5X12=60Marks)
Answer ALL Questions.
16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                                             Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water   (b) Pigments   (c) Light   (d) H2S

2. *Thiobacillus thiooxidans* is an example of--------
   (a) Chemoautotrophs   (b) Heterotrophs   (c) Photoautotrophs   (d) Copiotrophs

3. The organisms which tolerate high pressure are called
   (a) Halotolerant   (b) Barotolerant   (c) Psychrophilic   (d) Thermotolerant

4. Chemostat is associated with
   (a) Synchronous culture   (b) Batch culture   (c) Continuous culture   (d) Diauxic growth

5. All the following are intermediates of TCA cycle except
   (a) Citric acid   (b) Fumaric acid   (c) Lactic acid   (d) Ketoglutaric acid

6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP   (b) ED   (c) HMP   (d) TCA cycle

7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound   (b) Oxygen   (c) Nitrogenous compound   (d) Carbon dioxide

8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*   (b) *Chlorella* sp   (c) *Klebsiella* sp   (d) *Escherichia coli*

9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water   (b) Sunlight   (c) H2S   (d) O2

10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid   (b) Carbohydrate   (c) Protein   (d) None of the above

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria.   Or
    (b) What are copiotrophs? Describe with suitable examples.

12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth.   Or
    (b) Give an account on Diauxic growth.

13. (a) Giving suitable example, describe substrate level phosphorylation.   Or
    (b) Describe ED pathway.

14. (a) Describe alcoholic fermentation.   Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.

15. (a) What is anoxygenic photosynthesis? Describe.   Or
    (b) Give a brief note on Bioluminescence.

SECTION – C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria.   Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.

17. (a) Discuss in detail the different phases of growth.   Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.
1. Hot air oven functions based on the principle of
   a. dry air sterilization b. moist air sterilization c. membrane filtr d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization b. incineration c. autoclave d. oven.
3. Lyophilization is the
   a. separation of proteins b. sudden freezing and dehydration c. enzyme reaction by oxidation d. high pressure–segmentation.
4. The pH is defined as
   a. logH⁺ b. log2H⁺ c. -logH⁺ d. -log2H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution b. lead sulphate c. anions d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid b. lipid c. protein d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solutio b. nucleic acid c. proteins d. enzymes.
8. NPK analysis is done using
   a. electrophoresi b. centrifugation c. flame photo d. chromatography.
9. The pH of the blood is
   a. 6.3 b. 7.4 c. 7.0 d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION B(5X6=30Marks) - Answer ALL Questions.
11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
   b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14. a. Write down the principle and applications of Flame photometry. (or)
b. Write a note on NPK analysis.

15. a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.

17. a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18. a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.

19. a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.

20. a. What is a buffer solution? State the common buffer compounds used in biology. with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs                                      Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in -------- to prove that the RNA also act as genetic material
   a) TMV     b) Retrovirus  c) Pox   d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A      b) B      c) C      d) Z

3) ----------Enzyme resolves the super coiling during replication of *E.Coli*
   a) gyrase  b) helicase  c)polymerase    d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg c) Meselson &stahl   d) Hershey & Chase

5) ---------- no of codons constitute the coding dictionary
   a) 64  b) 61  c) 62  d) 60
6) CAP is involved in----------?
   a) Catabolic repression  b) Induction c) feed back inhibition  d) None of these
7) ---------is an example for intercalating agent?
   a) Acridine orange  b) EMS  c) Nitrous oxide  d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair d) all of the above
9) Davis-u-tube exp is used to prove the existance of--------?
   a) Transformation  b) conjugation c) transduction d0 recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger  c) Grick d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA  OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment  OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code  OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test  OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction  OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?  OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli  OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?  OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene  OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given
1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner
2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.
3) __________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes
4) __________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG
5) Type I hypersensitivity is otherwise called as __________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.
6) LATS refer to ______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.
7) The antibody causing agglutination is called as __________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin
8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.
9) Grafts between two genetically non identical members of the same species are called as ____________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft
10) The method of transferring immunity by means of lymphoid cells is known as __________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.
12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.
13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.
14) a) Giva a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.
15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16) a) Describe inflammatory barrier  (or)
    b) Define and describe MALT.
17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins
18) a) Describe the primary and secondary mediators of anaphylaxis  (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)  
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)  
   b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of  
   (a) lacti   (b) pyruvic acid   (c) fumaric acid   (d) aminoacids
2. All the following genera of bacteria produce pigments except  
   (a) Serratia    (b) Flavobacterium    (c) Micrococcus    (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of  
   (a) 62.8°C, 30 min   (b) 62.5°C, 30 min   (c) 71.7°C, 15 sec   (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of  
   (a) Aspergillus    (b) Bacillus    (c) Saccharomyces    (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except  
   (a) beer    (b) sauerkraut    (c) soft drinks    (d) fruit juice
6. A can with a minute leak during storage is called a  
   (a) breather    (b) springer    (c) flipper    (d) sparger
7. The term leavening is associated with the preparation of  
   (a) soy sauce    (b) yoghurt    (c) bread    (d) cheese
8. All the following organisms contribute to acidity in idli batter except  
   (a) Leuconostoc mesenteroides    (b) Streptococcus faecalis    (c) Pediococcus cerevisiae    (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks  
   (a) collection of sample    (b) storage of sample at room temperature for 24 hr    (c) gathering information    (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is  
    (a) an enterotoxin    (b) a neurotoxin    (c) a hepatotoxin    (d) a nephrotoxin.

SECTION B (5x6=30Marks) - Answer ALL Questions.

11a) What is the significance of molds in food microbiology? Describe. (or)  
   b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)  
   b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)  
   b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)  
   b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.
19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI       (b) EcoRI      (c) HindIII    (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase    (b) E.coli ligase   (c) Salligase (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA         (b) Protein       (c) Phosphatase (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosal (b) Double stranded (c) Self replicating (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c)M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage        (b) Plasmid       (c) Plasmid and phage (d) Fungi.
7. Colony hybridization technique is employed for
   (a)Selection of vector (b)Unhybridised ones (c)Selection of desirable clones (d)None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation  (b) Microinjection
   (c) Transformation  (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus   (b) Thermus aquaticus
   (c) Thermobacter aquaticus(d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot  (b) Northern blot (c) Western blot (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. (a) Define cloning. Explain the various steps involved in cloning. Or
(b) Explain the action of Methylases.

12. (a) Write a note on YAC. Or
(b) Explain a typical cosmid vector.

13. (a) Give an account on cDNA synthesis. Or
(b) How will you purify plasmid DNA?

14. (a) How alpha complementation of lac Z helps one to identify clone? Or
(b) How will you identify a recombinant DNA by immunological assay?

15. (a) Explain Northern blotting technique. Or
(b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer All Questions.

16. (a) Define restriction enzyme and add a note on classification and its uses. Or
(b) Give a brief account on ligases.

17. (a) Explain the construction of cDNA and DNA library. Or
(b) Explain the chemical synthesis of DNA in laboratory.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
(b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Give a detailed account on gene transfer techniques. Or
(b) How will you identify the presence of r DNA in a cell?

20. (a) Explain Southern blotting technique and its applications. Or
(b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) -------------- are broad spectrum antiviral products
   a) Histones   b) IFN   c) Streptomycin   d) Nystatin

2) Xanthan gum is produced from
   a) Pseudomonas putida   b) Xanthomonas campestris   c) Xanthococcus   d) Zymomonas

3) --------------- is involved in the fusion of myloma cells with spleen cells
   a) PEG   b) PGA   c) IPTG   d) EtBr

4) Vaccines that require a carrier molecule for its activity is called as --------------
   a) Subunit   b) Whole cell   c) Antiidiotype   d) Peptide

5) -------------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes   b) Right border   c) Left border   d) IAA

6) Nopaline is --------------
   a) Unusual Amino acid   b) Nucleotide   c) Vitamin   d) Coenzyme

7) Example of an animal model involved in transgenesis
   a) Monkey   b) Snake   c) Dinosaurs   d) Mice
8) __________ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) __________ marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION – B (5X5=25Marks) - Answer ALL Questions.

11a) Write a brief account on commercial biosynthesis of interferons (or)
    d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotypic vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application and development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development - explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.

16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application (or)
    b) Discuss about transgenic - goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in __________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a
   a. open culture system  b. system that maintains constant cell conc.
   c. system with addition of nutrients d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product  b. Vitamin B12 as a by product
   c. Vitamin C as a by product  d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag     b. log    c. stationary d. decline
7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore b. Massachusetts Institute of technology
   c. MTCC d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol b. methane c. oil d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery  b. quality control  c. sterilization  d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid b. amino acid c. both d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**
11.a. Discuss the significance of microbes in the production of commercially important products.
    (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture  (or)
    .b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production. (or)
    b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making  (or)
    b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods. (or)
    b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**
16.a. Give a detailed account on the various methods of strain improvement  (or)
    b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.  (or)
    b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.  (or)
    b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.  (or)
    b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.  (or)
    b. Down stream processing—a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) -------------------- is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an an example for ----------- degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) -------------- is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as ----------- in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability ----------- number of E.coli can present in 100 ml of water
   a) 1  b) 0  c) 10  d) 100

9) Application of alum is in ----------- phase of water treatment

10) Super Bug was developed and patented by -----------
    a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION – C (5X12=60 Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?
   (a) Bejerinck    (b) D. Ivanowski    (c) W. Stanley    (d) M. Theiler

2. The spikes are otherwise
   (a) Peplomers    (b) Capsid    (c) Envelope    (d) Coat

3. The one step growth experiment was developed by
   (a) Bejerinck    (b) D. Ivanowski    (c) W. Stanley    (d) Max Delbruck and Emory Ellis

4. Single stranded DNA phage is
   (a) T4 phage    (b) MS2    (c) QB    (d) OX 174

5. The process of release of the prophage from the bacterial DNA is called
   (a) Conduction    (b) Transfection    (c) Insertion    (d) Induction

6. The int gene codes for the synthesis of an enzyme
   (a) Integrase    (b) Ligase    (c) Excisionase    (d) Replicase

7. TMV has a Linked transport of two substances in the same direction is called
   (a) Non – infectious ss RNA    (b) Infectious ss RNA
   (c) Non – infectious ss DNA    (d) Infectious ss DNA

8. Plant viruses penetrate the host cells through
   (a) Endodesmata    (b) Pore    (c) Echodesmata    (d) None of the above

9. In Herpes viridae the viral envelope adsorbs to the receptors on
   (a) Plasma membrane    (b) cytoplasm    (c) Nucleus    (d) None of the above

10. For measles, the immunogen is
    (a) Active but attenuated    (b) Inactive but attenuated    (c) Inactive heat killed    (d) Inactivated

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or
    (b) Write a note on viral envelopes and enzymes.

12. (a) Explain the one step growth experiment. Or
    (b) Give an account on the structure of a typical bacterial virus.

13. (a) Give an account on reproduction of RNA phage. Or
    (b) Describe lysogenic conversion and its significance.

14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or
    (b) Write a note on characteristics of the viruses that infect algae and fungi.

15. (a) Write short notes on AIDS. Or
    (b) Give a brief outline on Rubella virus.

SECTION – C (5X12=60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or
    (b) Give a brief account on the early development of virology.

17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or
    (b) Give a detailed account on ss DNA phage.

18. (a) Describe the temperate bacteriophages and lysogeny. Or
    (b) Give a brief account on generation of defective phages and their uses.

19. (a) Explain briefly the reproduction of plant viruses. Or
    (b) Give a detailed account on viruses and cancer.

20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or
    (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called a. immuned  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
5. Spot the Gram positive anaerobic endospore forming bacillus a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigella  d. Staphylococcus
8. Darting motility is seen with a. E .coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae a. SS agar  b. BSA  c. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is a. faeces  b. urine  c. sputum  d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers. (or)
   b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)
   b. Give the features of B.anthracs
13.a. Describe the methods for diagnosis to tetanus (or)
   b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)
   b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidia. (or)
   b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples. (or)
   b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
   b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
   b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
   b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
   b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II
Duration – 3hrs  Maximum – 75 Marks
SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A tangled mass of hyphae is called as ________________
a) Hypha  b) Mycelium  c) Mould  d) Fungi
2. ________________ is an important opportunistic pathogen in HIV infected persons.
a) P. marneffci  b) P. notatum  c) Rhizopus  d) Mucor
3. Candidosis is caused mainly by __________
a) C. albicans  b) C. tropicalis  c) C. pseudotropicalis  d) C. krusei
4. The major organism which causes urinary tract infection is ____________
a) E. coli  b) Salmonella  c) Shigella  d) Klebsiella
5. Traveller's diarrhea is caused by ____________
a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli
c) Enteroinvasive E. coli  d) Enterotoxigenic E.coli
6. Blue pus is caused by _______ a) Pseudomonas  b) Vibrio  c) Salmonella  d) E. Coli
7. Sexually transmitted disease is caused by ___________
a) Treponema  b) Klebsiella  c) Proteus  d) Pseudomonas
8. Invasion of microorganisms into the bloodstream is called as___________
a) Septicemia  b) bacteremia  c) Viremia  d) Algemia
9. MIC denotes ________________
a) Maximum inhibitory concentration  b) Minimum inhibitory concentration
c) Multiple inhibitory concentration  d) None of the above
10. Endoflagella is a characteristic nature present in _____________
a) Spriochetes  b) Salmonella  c) Proteus  d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. a) Comment on superficial infection. (or)
      b) Describe candidiasis
12. a) Comment on Taenia solium  (or)  b) Give a brief note on Ascaris.
13. a) Describe the etiology and laboratory diagnosis of urinary tract infections.  (or)
      b) Describe respiratory tract infections.
14.a) Describe briefly on pyogenic infections.  (or)  b) Comment on Pseudomonas.
15.a) Explain the mechanism of drug resistance  (or)
      b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.
16.a) Add a note on opportunistic fungal infections  (or)
      b) Aspergillosis Describe.
17.a) Describe Trichusis trichura  (or)
      b) Comment on Wuchereria bancrofti
18.a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli  (or)
      b) Comment on pyogenic infections caused by Staphylococcus.
19.a) Comment on meningitis  (or)  b) Describe pyrexia
20.a) Describe drug resistance nature of bacteria
      b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER 1 - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs                      Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients’ blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.
2. All the following are transport media except,
   a) Stuarts medium  b) Glycerol saline medium  c) Cary Blair medium  d) Thioglycollate broth
3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne  b) Ingestion  c) Direct inoculation  d) Mucous membrane contact.
4. Needles should not be recapped, bent or broken after use.
   a) True  b) False
5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid  b) Blood  c) Semen  d) CSF
6. Sputum can be liquefied with the following except,
   a) Dithiothreitol  b) Sputolysin  c) Sputasol  d) Lysozyme
7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol  b) Sodium hypochlorite  c) 2% Glutaraldehyde  d) Chloroform
8. Following media are used for blood culture except,
   a) Brain heart infusion medium  b) Cooked meat medium  c) Saponin broth  d) Selenite F broth
9. A rapid method for the screening of HIV is
   a) Dot – ELISA  b) ELISA  c) Western blot  d) PCR
10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium  b) Acid fast staining  c) Animal susceptibility  d) Fluorescent Microscopy.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?
12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.
13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.
14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.
15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. a) List the Universal Precautions. (OR)
   b) Describe the procedures used for culturing anaerobic microorganisms.
17. a) Classify infectious biological agents on the basis of hazards. (OR)
   b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.
18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
   b) How can individual pathogenic viruses be identified in the lab.
19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
   b) State the special precautions necessary to process a sputum sample suspected for the presence of Mycobacterium tuberculosis.
20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
   b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs          Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine  c) Urine form catheter bag  d) Early morning urine sample
2. All the following are acid fast except,
   a) Mycobacterium  b) Actinomyces  c) Nocardia  d) Staphylococci
3. The common medium used for growing M tuberculosis is
   a) Blood agar  b) Mac conkey agar  c) Lowenstein Jensen’s medium  d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) E. coli  b) Kiebsiella pneumoniae  c) Proteus vulgaris  d) Pseudomonas aeruginosa
5. Selective medium for Staphylococci is
   a) EMB agar  b) BSA  c) MSA  d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm
7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies  d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None
10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”.

   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)

   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)

   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)

   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)

   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)

   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)

   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)

   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)

   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe? Where can one obtain such information? In this information available for all pathogens. (OR)

   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs                                                  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria    b) Protozoa    c) Virus    d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica  b) Entamoeba coil  c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs  b) Larvae penetrating through the skin
   c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION B (5X6=30 Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dennatophytoses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium.* (OR)
    b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
    b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
    b) Immunofluorescence — a technique to detect viral infections — Explain.
REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY with Semester System (with effect from 2007-2008)

1. Eligibility for Admission to the Course
Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology / Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. Duration of the Course
The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. Course of Study
The course of study for the UG degree courses of all branches shall consist of the following

a) Part - I
Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

The subject shall be offered during the first four semesters with one examination at the end of each semester.

b) Part – II : English
The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

c) Foundation Course
The Foundation course shall comprise of two stages as follows:
Foundation Course A : General Awareness (I & II semesters)
Foundation Course B : Environmental Studies (III & IV semesters)

The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
From the printed material supplied by the University - 75%
Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A**: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester.

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme**:
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 fields and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

a) A candidate will be permitted to appear for the university examinations for any semester if

   i) He/she secures not less than 75% of attendance in the number of working days during the semester.

   ii) He/she earns a progress certificate from the head of the institution, of having satisfactorily completed the course of study prescribed in the subjects as required by these regulations, and

   iii) His/her conduct has been satisfactory.

Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.”
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**.

b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

(ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

(iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an
      institution approved by/affiliated to the University or has been exempted from in the manner
      prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a
      certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the
   first attempt, within the minimum period prescribed for the course of study from the date of
   admission to the course and secures I or II class shall be eligible for ranking and such ranking
   will be confined to 10 % of the total number of candidates qualified in that particular branch of
   study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical
   shall be permitted to do so and such candidate shall join a college in the III year of the course
   and he/she will be permitted to appear for par III alone by granting exemption form appearing
   Part I, Part II and common allied subjects (if any), already passed by the candidate. And a
   candidate desirous to obtain an additional UG degree involving practical shall be permitted to
   do so and such candidate shall join a college in the II year of the course and he/she be permitted
   to appear for Part III alone by granting exemption form appearing for Part I, Part II and the
   common allied subjects. If any, already passed. Such candidates should obtain exemption from
   the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective
   courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each
   paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change
   for a minimum period of three years from the date of approval of the Regulations. The
   University may revise/amend/change the Regulations and Scheme of Examinations, if found
   necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will
   be permitted to take the Examinations under those Regulations for a period of four years i.e. up
   to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the
   Examination only under the Regulations in force at that time.
## SCHEME OF EXAMINATIONS

<table>
<thead>
<tr>
<th>Sem</th>
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<th>Subject and Paper</th>
<th>Instruction Hrs per week</th>
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Total: B.Sc., Microbiology
Diploma in Diagnostic Microbiology 3200

* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II  
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I  

UNIT – II  

UNIT – III  
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV  
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora,Agaricus, Dictyostelium.

UNIT – V  

References  
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacdpiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount – LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
2. Tortora, Funke and case. Microbiology, 8th edition
SEMESTER – IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High speed, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT - III


UNIT – IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMMESTER IV
GRA CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al./ Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment – mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S., 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References


SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

 Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction; Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application,-Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application , Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplasmic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose, Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane waste- coir pith composition- composting, principles and Applications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V


References
UNIT- I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms *Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diphtheriae*.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- *Clostridium perfringens, Clostridium tetani*.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms *Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae*.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- *Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydias, Rickettsiae*.

References

5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II

MEDICAL MICROBIOLOGY - II

UNIT- I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References


SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli*, *Klebsiella pneumonias*, *Proteus*, *Salmonella*, *Shigella*, *Pseudomonas*, *Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans*, *Cryptococcus neoformans*, and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus*, *Mucor*, *Penicillium*, *Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization - Demonstration
15. Observation of parasites – *Entamoeba*, *Plasmodium*, *Ascaris*, *Taenia*.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT –IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

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Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectorophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunoelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1) Who is called as "Father of Microbiology"?
   a) Robert Koch  b) Louis Pasteur  c) Antony Von Leewenhock  d) Both b & c
2) Immunity mediated by antibodies are called as _____________
   a) Humoral  b) Cell mediated  c) Active  d) Passive
3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.
4) _____________ is used as a counter stain in spare staining
   a) Safranin  b) Methylene blue  c) Malachite green  d) Crystal violet
5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP  b) TDT  c) D  d) None of the above.
6) HEPA filters can remove particles of size _____________
   a) 0.2 um  b) 0.3 um  c) 0.4 um  d) 0.5 um
7) McIntosh fildes jar method is used for cultivating _____________
   a) Aerobic organisms  b) Anaerobic organisms  c) Facultative anaerobic organisms  d) Microphilic organisms
8) _____________ is an example for selective media.
   a) Mac conkey agar  b) EMB agar  c) Both a & b  d) None of the above.
9) TVC refers to _____________
   a) Total viable count  b) Total viral count  c) Total viable colony  d) None of the above.
10) _____________ is an example for short term preservation of microbes.
    a) Agar slant  b) Agar slant  c) Mineral oil overlay  d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.
11) a) Discus the contributions of Lister, Pasteur and koch to the germ theroy of disease and to the treatment or prevention of diseases.  (or)
    b) Describe koch's postulates in detail.
12) a) Describe fluorescence microscope  (or)
    b) Describe capsule staining.
13) a) Write the principle and application of autoclave.  (or)
    b) Comment on phenol coefficient test.
14) a) Comment on pure culture techniques.  (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.
15) a) Discuss about the CO₂ liberation for the estimation of microbes.  (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY

Duration – 3hrs                                    Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram   (b) Similarity matrix   (c) Dendrogram   (d) None of the above
3. Which of the following is a motile bacterium
   (a) Esherichia coli   (b) Klebsiella   (c) Bacillus subtilis   (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall   (b) Colonies have fried egg appearance   (c) Require sterols for growth   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast   (b) Plastid   (c) Thylakoid   (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens   (b) Halophiles   (c) Thermophiles   (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores   (b) Zygosporres   (c) Basidiospores   (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores   (b) Zygosporres   (c) Conidiospores   (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae   (b) Green algae   (c) Blue green algae   (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall   (b) Move by flagella/pseudopodia   (c) Unicellular   (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) What is serotaxonomy? explain. Or  
(b) Describe any two important characteristics used in serotaxonomy.

12. (a) Give distinguishing characters of clostridium. Or  
(b) State the important features and significance of enterobacteria.

13. (a) Compare the cell walls of eubacteria and archaebacteria. Or  
(b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.

14. (a) Explain the life cycle of Mucor Or  
(b) Describe briefly the life cycle of Dictyostelium.

15. (a) Give a brief account of pseudopodia. Or  
(b) Explain the general characters and the importance of Euglenophyta.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach? Or  
(b) List out and describe the genetic characters used in taxonomy.

17. (a) What are the general characteristics of actinomycetes? Describe. Or  
(b) Give a detailed account of Bergeys manual and its importance.

18. (a) Summarise the major characteristics of archaebacteria. Or  
(b) Classify the photosynthetic eubacteria listing out their important features with suitable examples.

19. (a) Discuss in detail the general characteristics of fungi. Or  
(b) With neat diagram describe the life cycle of Agaricus.

20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or  
(b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria  
(a) Peptidoglycan  (b) Lipopolysaccharide  
(c) Peptidoglycan + Lipopolysaccharide+ compounds  (d) other compounds

2. Polarity flagellated bacteria is known as ---------  
(a) Lophotrichous  (b) Peritrichous  
(c) Atrichous  (d) Axial filaments
3. Where does energy production occurs in eukaryotes?
   (a) Cytoplasmic membrane  
   (b) Mitochondria  
   (c) Polyphosphate granules  
   (d) Periplasmic space

4. Features of nuclear envelope includes
   (a) Ribosomes  
   (b) A double membrane structure  
   (c) Communication with cytoplasm  
   (d) Both b & c.

5. Insertional vectors are derived from
   (a) Bacterial plasmid  
   (b) Phage lambda  
   (c) M13 Phage  
   (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of
   (a) Phage  
   (b) Plasmid  
   (c) Plasmid and phage  
   (d) Fungi

7. Linked transport of two substances in the same direction is called
   (a) Antiport  
   (b) Facilitated diffusion  
   (c) Symport  
   (d) Passive diffusion

8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells  
   (b) Prokaryotic cells  
   (c) Both a & b  
   (d) None of the above

9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles  
   (b) Extreme thermophiles  
   (c) Acidophiles  
   (d) Osmophiles

10. In Archaebacteria the lipids are linked by
   (a) Monomer linkage  
   (b) Ether linkage  
   (c) B 1-4 linkage  
   (d) Ionic linkage

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Describe the capsule and slime layer of prokaryotic cell.  
    (b) Write a note on reserve materials.

12. (a) Explain the structure and functions of Endoplasmic reticulum.  
    (b) Write short notes on Nucleus.

13. (a) Give an account on cDNA synthesis.  
    (b) How will you purify plasmid DNA?

14. (a) Explain Facilitated diffusion.  
    (b) Write a note on phagocytosis and pinocytosis.

15. (a) Write a note on cell wall of Archaebacteria.  
    (b) What are methanogens? Exemplify the role with examples.

SECTION–C(5X12=60Marks)
Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization.  
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.

17. (a) Explain the structure and functions of Mitochondria and Chloroplast.  
    (b) Write a brief account on eukaryotic cell wall.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  
    (b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Write a brief note on active transport of nutrients in a bacterial cell.  
    (b) Give a brief account on group translocation mechanism.

20. (a) Give a brief account on Halophiles.  
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water     (b) Pigments    (c) Light     (d) H2S

2. *Thiobacillus thiooxidans* is an example of---------
   (a) Chemoautotrophs (b) Heterotrophs (c) Photoautotrophs (d) Copiotrophs

3. The organisms which tolerate high pressure are called
   (a) Halotolerant  (b) Barotolerant  (c) Psychrophilic  (d) Thermotolerant

4. Chemostat is associated with
   (a) Synchronous culture  (b) Batch culture  (c) Continuous culture  (d) Diauxic growth

5. All the following are intermediates of TCA cycle except
   (a) Citric acid    (b) Fumaric acid    (c) Lactic acid    (d) Ketoglutaric acid

6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP       (b) ED       (c) HMP     (d) TCA cycle

7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound  (b) Oxygen  (c) Nitrogenous compound  (d) Carbon dioxide

8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*  (b) *Chlorella sp*  (c) *Klebsiella sp*  (d) *Escherichia coli*

9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water    (b) Sunlight    (c) H2S    (d) O2

10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid    (b) Carbohydrate  (c) Protein    (d) None of the above

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.

12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.

13. (a) Giving suitable example , describe substrate level phosphorylation. Or
    (b) Describe ED pathway.

14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.

15. (a) What is anoxygenic photosynthesis ? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION – C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram , describe the event of endospore formation in bacteria. Or
    (b) With suitable examples , classify bacteria based on their nutritional requirements.

17. (a) Discuss in detail the different phases of growth.. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or 
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or 
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or 
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by
a. lyophilization  b. incineration  c. autoclave  d. oven.
3. Lyophilization is the
a. separation of proteins  b. sudden freezing and dehydration  c. enzyme reaction by oxidation  d. high pressure–segmentation.
4. The pH is defined as
a. logH⁺  b. log2H⁺  c. -logH⁺  d. -log2H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solutio  b. nucleic acid  c. proteins  d. enzymes.
8. NPK analysis is done using
   a. electrophoresi  b. centrifugation.  c. flame photo  d. chromatography.
9. The pH of the blood is
   a. 6.3  b. 7.4  c. 7.0  d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
11.b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
12.b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
13.b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
i. the concentration of ammonium sulphate in a saturated solution at 0°C.
ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”

(or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology.
with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------ to prove that the RNA also act as genetic material
a) TMV b) Retrovirus c) Pox d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A b) B c) C d) Z

3) ----------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase b) helicase c)polymerase d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad b) Tautam &Lederberg c) Meselson &stahl d) Hershey & Chase

5) ------------ no of codons constitute the coding dictionary
   a) 64 b) 61 c) 62 d) 60
6) CAP is involved in------------?
   a) Catabolic repression b) Induction c) feed back inhibition d) None of these

7) ----------is an example for intercalating agent?
   a) Acridine orange b) EMS c) Nitrous oxide d) UV

8) Lex protein are involved in ----type of repair?
   a) SOS b) photoreactivation c) Exision repair d) all of the above

9) Davis-u-tube extpt is used to prove the existance of--------?
   a) Transformation b) conjugation c) transduction d0 recombination

10) Transformation was proved and demonstrated by-----
    a) Griffith b) Sanger c) Grick d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA OR
    b) Discuss the characters of a genetic material

12) a) Prove that replication is semi conservative by a suitable experiment OR
    b) Describe DNA polymerase

13) a) Explain the features of genetic code OR
    b) Discuss attenuator control in trp operon

14) a) Discuss Ame’s test OR
    b) Discuss photoreactivation

15) a) Discuss briefly specialized transduction OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material OR
    b) Explain the different forms of DNA

17) a) How the naked DNA is condensed and organized in a prokaryotic cell? OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved

18) a) List and explain the negatively controlled operon in E.Coli OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA

19) a) Explain how the organism protects its DNA from damage? OR
    b) Explain the phenomenon involved in generation of mutants?

20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) ________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ________________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ________________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti   (b) pyruvic acid   (c) fumaric acid   (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia    (b) Flavobacterium    (c) Micrococcus    (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min    (b) 62.5°C, 30 min    (c) 71.7°C, 15 sec    (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus    (b) Bacillus    (c) Saccharomyces    (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer    (b) sauerkraut    (c) soft drinks    (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather    (b) springer    (c) flipper    (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce    (b) yoghurt    (c) bread    (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides    (b) Streptococcus faecalis    (c) Pediococcus cerevisiae    (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample    (b) storage of sample at room temperature for 24 hr    (c) gathering information    (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin    (b) a neurotoxin    (c) a hepatotoxin    (d) a nephrotoxin.

SECTION B(5X6=30Marks) - Answer ALL Questions.

11a) What is the significance of molds in food microbiology? Describe. (or)
   b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
   b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
   b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
   b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria.  
   (or) 
   b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.

16a) Discuss the importance of bacteria in food microbiology with suitable examples  
   (or) 
   b) What are the various factors that influence the growth of microorganisms in foods.

17a) Discuss the use of high temperature in food preservation.  
   (or) 
   b) Discuss the principles of food preservation.

18a) Write in detail about any six types of organism responsible for spoilage of vegetables  
   (or) 
   b) Discuss the biological spoilage of canned foods.

19) a) How is pickled cucumbers prepared? Describe . Add a note on the defects.  
   (or) 
   b) With neat flow chart describe the production of cheese.

20a) Describe in detail about food borne infections caused by bacteria.  
    (or) 
    b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs  
Maximum – 75 Marks

RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. GAATTC is the recognition sequence of 
   (a) BamHI    (b) EcoRI    (c) HindIII    (d) HaeIII

2. An example of a ligase capable of both blunt and cohesive end ligation is 
   (a) T4 ligase    (b) E.coli ligase    (c) Sal ligase    (d) All

3. Phosphoramidite method is used for the synthesis of 
   (a) DNA    (b) Protein    (c) Phosphatase    (d) Phosphoric acid

4. Plasmids are DNA strands which are 
   (a) Extrachromosomal    (b) Double stranded    (c) Self replicating    (d) All the above

5. Insertional vectors are derived from 
   (a) Bacterial plasmid    (b) Phage lambda    (c)M13 Phage    (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of 
   (a) Phage    (b) Plasmid    (c) Plasmid and phage    (d) Fungi.

7. Colony hybridization technique is employed for 
   (a)Selection of vector    (b)Unhybridised ones    (c)Selection of desirable clones    (d)None of the above

8. The introduction of DNA into a single eukaryotic cell with a fine needle 
   (a) Electroporation    (b) Microinjection    (c) Transformation    (d) None

9. Taq polymerase is isolated from 
   (a) Thermophilus aquaticus    (b) Thermus aquaticus    (c) Thermobacter aquaticus    (d) Thermus aquaticae

10. Hybridization technique used to detect protein in a gel is 
    (a) Southern blot    (b) Northern blot    (c) Western blot    (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. (a) Define cloning. Explain the various steps involved in cloning.    Or
    (b) Explain the action of Methylases.

12. (a) Write a note on YAC.    Or
    (b) Explain a typical cosmid vector.

13. (a) Give an account on cDNA synthesis.    Or
    (b) How will you purify plasmid DNA?

14. (a) How alpha complementation of lac Z helps one to identify clone?    Or
    (b) How will you identify a recombinant DNA by immunological assay?

15. (a) Explain Northern blotting technique.    Or
    (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16. (a) Define restriction enzyme and add a note on classification and its uses.    Or
    (b) Give a brief account on ligases.

17. (a) Explain the construction of cDNA and DNA library.    Or
    (b) Explain the chemical synthesis of DNA in laboratory.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.    Or
    (b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Give a detailed account on gene transfer techniques. Or
    (b) How will you identify the presence of r DNA in a cell?.

20. (a) Explain Southern blotting technique and its applications.    Or
    (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs  aximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) ---------- are broad spectrum antiviral products
    a) Histones    b)IFN    c) Streptomycin    d)Nystatin

2) Xanthan gum is produced from
    a) Pseudomonas putida    b) Xanthomonas campestris    c)Xanthococcus    d) Zymomonas

3) ---------- is involved in the fusion of myloma cells with spleen cells
    a) PEG    b)PGA    c) IPTG    d) EtBr

4) Vaccines that require a carrier molecule for its activity is called as ----------
    a) Subunit    b) Whole cell    c) Antiidiotype    d) Peptide

5) ---------- required for the transfer of the T DNA from A. tumifacience to plant cells
    a) vir genes    b) Right border    c) Left border    d) IAA

6) Nopaline is ----------
    a) Unusual Amino acid    b) Nucleotide    c) Vitamin    d) Coenzyme

7) Example of an animal model involved in transgenesis
    a) Monkey    b) Snake    c)Dinosaurs    d) Mice
8) __________ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) __________ marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION–B(5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
    d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application ad development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION–C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19) a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs                Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in __________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a________________
   a. open culture system   b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system

5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product

6. Antibiotics by microbes are usually elaborated at ___________ stage of their growth.
   a. lag     b. log     c. stationary     d. decline

7. The term single﹣cell protein was coined at___________ in 1966
   a. CFTRI, Mysore   b. Massachusetts Institute of technology
   c. MTCC   d. Imperial chemical Industries.

8. ________ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal

9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control   c. sterilization   d. packaging

10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid   c. both   d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**

11.a. Discuss the significance of microbes in the production of commercially important products.
    (or)   b. Write a short note on the isolation of alkaline protease producers from soil.

12.a. Explain briefly batch culture   (or)
    .b. Differentiate submerged and solid state fermentation.

13.a. Describe in detail fungal protease production.   (or)
    b. Discuss the methods of immobilization and add a note on its significance.

14.a. Describe the role of yeast in bread making   (or)
    b. Write about single cell protein.

15.a. Discuss the methods distruption of cells by physical methods.   (or)
    b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**

16.a. Give a detailed account on the various methods of strain improvement   (or)
    b. Discuss the methods for screening of industrially important microorganism.

17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.   (or)
    b. Give a detailed account on solid state fermentation with its applications.

18.a. Elaborate on the various steps involved in beer production.   (or)
    b. Write an essay on the commercial production in beer production.

19.a. Explain briefly the industrial application of yeast.   (or)
    b. Describe in detail the development of Oyster mushroom.

20.a. Describe in detail the recovery and purification of intracellular products with examples.   (or)
    b. Down stream processing-a multistage operation. Discuss.
**CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given**

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) ------------ is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an example for *********** degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) ------------ is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as *********** in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability *********** number of E.coli
   can present in 100 ml of water  a) 1  b) 0  c) 10  d) 100

9) Application of alum is in *********** phase of water treatment

10) Super Bug was developed and patented by ***********
    a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

**SECTION – B (5X6 = 30 Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

**SECTION – C (5X12 = 60 Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV? (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) M. Theiler

2. The spikes are otherwise (a) Peplomers (b) Capsid (c) Envelope (d) Coat

3. The one step growth experiment was developed by (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) Max Delbruck and Emory Ellis

4. Single stranded DNA phage is (a) T4 phage (b) MS2 (c) QB (d) OX 174

5. The process of release of the prophage from the bacterial DNA is called (a) Conduction (b) Transfection (c) Insertion (d) Induction

6. The int gene codes for the synthesis of an ------------ enzyme (a) Integrase (b) Ligase (c) Excisionase (d) Replicase

7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA (b) Infectious ss RNA (c) Non – infectious ss DNA (d) Infectious ss DNA

8. Plant viruses penetrate the host cells through (a) Endodesmata (b) Pore (c) Echodesmata (d) None of the above

9. In Herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane (b) Cytoplasm (c) Nucleus (d) None of the above

10. For measles, the immunogen is (a) Active but attenuated (b) Inactive but attenuated (c) Inactive heat killed (d) Inactivated

SECTION–B (5X6=30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or (b) Write a note on viral envelopes and enzymes.

12. (a) Explain the one step growth experiment. Or (b) Give an account on the structure of a typical bacterial virus.

13. (a) Give an account on reproduction of RNA phage. Or (b) Describe lysogenic conversion and its significance.

14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or (b) Write a note on characteristics of the viruses that infect algae and fungi.

15. (a) Write short notes on AIDS. Or (b) Give a brief outline on Rubella virus.

SECTION–C (5X12=60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or (b) Give a brief account on the early development of virology.

17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or (b) Give a detailed account on ss DNA phage.

18. (a) Describe the temperate bacteriophages and lysogeny. Or (b) Give a brief account on generation of defective phages and their uses.

19. (a) Explain briefly the reproduction of plant viruses. Or (b) Give a detailed account on viruses and cancer.

20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs  Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called a. immuned  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
5. Spot the Gram positive anaerobic endospore forming bacillus a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae a. SS agar  b. BSA  d. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is a. faeces  b. urine  c. sputum  d. blood

SECTION – B (5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers. (or)  b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)  b. Give the features of B.anthraxis
13.a. Describe the methods for diagnosis to tetanus (or)  b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)  b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidiae. (or)  b. Give the features of Rickettsiae.

SECTION – C (5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples. (or)  b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)  b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)  b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)  b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)  b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as _____________
   a) Hypha  b) Mycelium  c) Mould  d) Fungi
2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci  b) P. notatum  c) Rhizopus  d) Mucor
3. Candidosis is caused mainly by _____________
   a) C. albicans  b) C. tropicalis  c) C. pseudotropicalis  d) C. krusei
4. The major organism which causes urinary tract infection is _____________
   a) E. coli  b) Salmonella  c) Shigella  d) Klebsiella
5. Traveller's diarrhea is caused by _____________
   a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli  d) Enterotoxigenic E.coli
6. Blue pus is caused by _______ a) Pseudomonas b) Vibrio  c) Salmonella  d) E. Coli
7. Sexually transmitted disease is caused by _____________
   a) Treponema  b) Klebsiella  c) Proteus  d) Pseudomonas
8. Invasion of microorganisms into the bloodstream is called as _____________
   a) Septicemia  b) bacteremia  c) Viremia  d) Algemia
9. MIC denotes _____________
   a) Maximum inhibitory concentration  b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration  d) None of the above
10. Endoflagella is a characteristic nature present in _____________
    a) Spirochetes  b) Salmonella  c) Proteus  d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or) b) Describe candidiasis
12. a) Comment on Taenia solium  (or) b) Give a brief note on Ascaris.
13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or) b) Describe respiratory tract infections.
14. a) Describe briefly on pyogenic infections. (or) b) Comment on Pseudomonas.
15. a) Explain the mechanism of drug resistance (or) b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or) b) Aspergillosis Describe.
17. a) Describe Trichusis trichura  (or) b) Comment on Wucheraria bancrofti
18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli  (or) b) Comment on pyogenic infections caused by Staphylococcus.
19. a) Comment on meningitis  (or) b) Describe pyrexia
20. a) Describe drug resistance nature of bacteria  b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs                              Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuart's medium  b) Glycerol saline medium  c) Cary Blair medium  d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne  b) Ingestion  c) Direct inoculation  d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True  b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid  b) Blood  c) Semen  d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol  b) Sputolysin  c) Sputasol  d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol  b) Sodium hypochlorite  c) 2% Glutaraldehyde  d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium  b) Cooked meat medium  c) Saponin broth  d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA  b) ELISA  c) Western blot  d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium  b) Acid fast staining  c) Animal susceptibility  d) Fluorescent Microscopy.

SECTION B (5X6=30 Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
   b) Describe the procedures used for culturing anaerobic microorganisms.
17. a) Classify infectious biological agents on the basis of hazards. (OR)
   b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.
18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
   b) How can individual pathogenic viruses be identified in the lab.
19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
   b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.
20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
   b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs          Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample
2. All the following are acid fast except,
   a) *Mycobacterium* b) *Actinomycetes* c) *Nocardia* d) *Staphylococci*
3. The common medium used for growing *M tuberculosis* is
   a) Blood agar b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli* b) *Kiebsiella pneumoniae* c) *Proteus vulgaris* d) *Pseudomonas aeruginosa*
5. Selective medium for *Staphylococci* is a) EMB agar b) BSA c) MSA d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm b) 24mm c) 28mm d) 30mm
7. VDRL is an example for
   a) Agglutination b) Precipitation c) Complement fixation test d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh (D) - negative b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen b) Antibody c) Antigen and Antibody d) None
10. Blotting of DNA is called
    a) Western blot b) Southern blot c) Northern blot d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe?
    Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica  b) Entamoeba coil  c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs. b) Larvae penetrating through the skin
b) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
   b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing.  
   b) Name the specimen collected for dermatophytooses. Is it necessary to store such specimens?  
      How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male?  
      b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — P. falciparum.  
      b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis.  
      b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent.  
      b) Immunofluorescence — a technique to detect viral infections — Explain.
REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and
COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY
with Semester System
(with effect from 2007-2008)

1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.
      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)
      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) **Part – III**

**Group A**: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester.

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme**: All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows:

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**
   a) A candidate will be permitted to appear for the university examinations for any semester if
   i) He/she secures not less than 75% of attendance in the number of working days during the semester.
   ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and
   iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**
   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**
   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**
   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**
   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**
   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**
    a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

    b) i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

       ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

       iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
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* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique—Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) - General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – Mcintosh fildes jar
16. Micrometry

References

SEMESTER –III  
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I
Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II

UNIT -III

UNIT- IV
Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V
Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER – IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave , Hot air oven , Incubator , Water Bath , Laminar air flow, BOD incubator, Centrifuges – Bench top , High speed , Ultra centrifuge.

UNIT – II

pH meter , Conductivity meter, Lyophilizer , McIntosh anaerobic jar , Biosensor, Metabolic shaker.

UNIT - III


UNIT – IV


UNIT – V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GRA CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al/Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER - V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) – factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV

Fermented food – pickled cucumber, saurkraut, soysauce, Bread, Idli – Fermented dairy products – Yoghurt and cheese.

UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks – food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT - V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application, - Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References
SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References

SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT - I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT - II
Microbial decomposition; cellulose, Hemi cellulose, lignin, pectin and chitin. – Factors influencing degradation- acetate utilization -bioconversion of organic wastes- sugarcane waste-coir pith composition- composting, principles and Applications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V


References

SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diphtheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydia, Rickettsiae.

References

5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II

MEDICAL MICROBIOLOGY - II

UNIT - I

UNIT - II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT - III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT - IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT - V

References
SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus* and *Streptococcus pyogenes.*
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia.*
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References

SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs                                                    Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert koch    b) Louis Pasteur    c) Antony Von Leewenhock    d) Both b & c

2) Immunity mediated by antibodies are called as ________________
   a) Humoral       b) Cell mediated     c) Active       c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) ___________ is used as a counter stain in sparing staining
   a) Safranin       b) Methylene blue    c) Malachite green   d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP           b) TDT               c) D                  d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um         b) 0.3 um       c) 0.4 um       d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms   b) Anaerobic organisms    c) Facultative anaerobic organisms   d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar    b) EMB agar   c) Both a & b   d) None of the above.

9) TVC refers to ___________
    a) Total viable count   b) Total viral count   c) Total viable colony   c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant   b) Agar slant   c) Mineral oil overlay   d) a,b & c.

SECTION–B (5X6=30 Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - AnswerALLQuestions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II -MICROBIAL DIVERSITY

Duration – 3hrs Maxi mum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain  (b) Genus  (c) Species  (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram  (b) Similarity matrix  (c) Dendrogram  (d) None of the above
3. Which of the following is a motile bacterium
   (a) Escherichia coli  (b) Klebsiella  (c) Bacillus subtilis  (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall  (b) Colonies have fried egg appearance  (c) Require sterols for growth
      (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast  (b) Plastid  (c)Thylakoid  (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens  (b) Halophiles  (c) Thermophiles  (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores  (b)Zygospores  (c) Basidiospores  (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores  (b) Zygospores  (c) Conidiospores  (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae  (b) Green algae  (c) Blue green algae  (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall  (b) Move by flagella/pseudopodia
       (c) Unicellular  (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or  
(b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or  
(b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or  
(b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples
14. (a) Explain the life cycle of Mucor Or  
(b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or  
(b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important in this approach Or  
(b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or  
(b) Give a detailed account of bergeys manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or  
(b) Classify the photosynthetic eubacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi. Or  
(b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta Or  
(b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan  (b) Lipopolysaccharide  
   (c) Peptidoglycan + Lipopolysaccharide+ compounds  (d) other compounds
2. Polarly flagellated bacteria is known as ---------
   (a) Lophotrichous  (b) Peritrichous  
   (c) Atrichous  (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope include
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**

11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

**SECTION–C(5X12=60Marks) Answer ALL Questions.**

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water  (b) Pigments  (c) Light  (d) H2S
2. *Thiobacillus thiooxidans* is an example of--------
   (a) Chemoautotrophs  (b) Heterotrophs  (c) Photoautotrophs  (d) Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant  (b) Barotolerant  (c) Psychrophilic  (d) Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture  (b) Batch culture  (c) Continuous culture  (d) Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid  (b) Fumaric acid  (c) Lactic acid  (d) Ketoglutaric acid
6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP  (b) ED  (c) HMP  (d) TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound  (b) Oxygen  (c) Nitrogenous compound  (d) Carbon dioxide
8. Which of the following carries out mixed acid fermentation?
   (a) Saccharomyces cerevisiae  (b) Chlorella sp  (c) Klebsiella sp  (d) Escherichia coli
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water  (b) Sunlight  (c) H2S  (d) O2
10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid  (b) Carbohydrate  (c) Protein  (d) None of the above

SECTION – B(5X6=30 Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.
13. (a) Giving suitable example, describe substrate level phosphorylation. Or
    (b) Describe ED pathway.
14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a) What is anoxygenic photosynthesis? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION – C(5X12=60 Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria. Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with CO₂ as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
(b) Describe the C₃ pathway of CO₂ fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization  b. incineration  c. autoclave  d. oven.
3. Lyophilization is the
   a. separation of proteins  b. sudden freezing and dehydration  c. enzyme reaction by oxidation  d. high pressure–segmentation.
4. The pH is defined as
   a. logH⁺  b. log2H⁺  c. -logH⁺  d. -log2H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solutio  b. nucleic acid  c. proteins  d. enzymes.
8. NPK analysis is done using
   a. electrophoresi  b. centrifugation.  c. flame photo  d. chromatography.
9. The pH of the blood is
   a. 6.3  b. 7.4  c. 7.0  d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
   b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
   b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
   b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**

16.a. Discuss the principle, types and applications of centrifuge. (or)
   b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
   b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
   b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
   b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology. with their applications (or)
   b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

**CORE PAPER VI - MICROBIAL GENETICS**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A ( 10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------ to prove that the RNA also act as genetic material
   a) TMV   b) Retrovirus   c) Pox   d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A   b) B   c) C   d) Z

3) -----------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase   b) helicase   c)polymerase   d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad   b) Tautam &Lederberg   c) Meselson &stahl   d) Hershey & Chase

5) ----------- no of codons constitute the coding dictionary
   a) 64   b) 61   c) 62   d) 60
6) CAP is involved in---------------?
a) Catabolic repression    b) Induction c) feed back inhibition d) None of these
7) -----------is an example for intercalating agent?
a) Acridine orange   b) EMS    c) Nitrous oxide       d) UV
8) Lex protein are involved in ----type of repair?
a) SOS    b) photoreactivation   c) Exision repair d) all of the above
9) Davis-u-tube expt is used to prove the existance of--------?
a) Transformation   b) conjugation   c) transduction d0 recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith   b) Sanger   c) Grick d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA     OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment     OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code     OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test     OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction     OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material     OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?     OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the
    enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli     OR
    b) Describe the mechanism involved in the transformation of information from DNA to
    RNA
19) a) Explain how the organism protects its DNA from damage?     OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact
    between cells and how it is exploited in mapping gene
    OR
    b) Explain the phenomenon involved in generation of genetic variation by the
    uptake of
    naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock    b) Robert Kock   c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis       b) Hematopoiesis      c) Hemoglobin    d) None of the above.

3) ________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody        b) Haptens       c) Adjuvants      d) Epitopes

4) ________________ is the immunoglobulin which can cross the placenta.
   a) IgA          b) IgD         c) IgM           d) IgG

5) Type I hypersensitivity is otherwise called as ________________
   a) Cell Stimulating    b) Delayed type  c) Anaphylactic d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator   b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ____
   a) Ligand  b) Analyte     c) Both a & b d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as __________
   a) Allografts  b) Autograft  c) Isograft    d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ________
    a) Adoptive immunisation b) Adaptive immunisation c) Combined d) None of the above.

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus.  (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction.  (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA     (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system.   (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier      (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity.   (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis  (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)  
b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)  
b) Give a brief note on the mechanisms involved in graft rejection.

**CORE PAPER VIII - FOOD MICROBIOLOGY**

**Duration – 3hrs**  
**Maximum – 100 Marks**

**SECTION A (10 x 1= 10 Marks)**  
Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of  
   (a) lacti  (b) pyruvic acid  (c) fumaric acid  (d) aminoacids
2. All the following genera of bacteria produce pigments except  
   (a) *Serratia*  (b)*Flavobacterium*  (c) *Micrococcus*  (d)*Klebsiella*
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of  
   (a)62.8C, 30 min  (b)62.5C,30 min  (c) 71.7C, 15 sec  (d) 71.7C, 15 min
4. Ropiness of bread is caused by species of  
   (a) *Aspergillus*  (b) *Bacillus*  (c) *Saccharomyces*  (d) *Serratia*
5. Filtration is a suitable method of removal of microorganisms from the following except  
   (a) beer  (b)sauerkraut  (c)soft drinks  (d) fruit juice
6. A can with a minute leak during storage is called a  
   (a) breather  (b) springer  (c)flipper  (d) sparger
7. The term leavening is associated with the preparation of  
   (a) soy sauce  (b)yoghurt  (c) bread  (d) cheese
8. All the following organisms contribute to acidity in idli batter except  
   (a) *Leuconostoc mesenteroides*  (b) *Streptococcus faecalis*  
   (c) *Pediococcus cerevisiae*  (d)*Staphylococcus aureus*
9. Which of the following should be avoided while investigating food poisoning outbreaks  
   (a) collection of sample  (b) storage pf sample at room temperature for 24 hr  
   (c) gathering information  (d)laboratory testing
10. The toxin produced by *Staphylococcus* sp in food is  
    (a) an enterotoxin  (b)a neurotoxin  (c) a hepatotoxin  (d) a nephrotoxin.

**SECTION B (5X6=30Marks) - Answer ALL Questions.**

11a) What is the significance of molds in food microbiology? Describe. (or)  
b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)  
b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)  
b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)  
b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.
19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI (b) EcoRI (c) HindIII (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase (b) E.coli ligase (c) Sal ligase (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA (b) Protein (c) Phosphatase (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosomal (b) Double stranded (c) Self replicating (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c)M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi.
7. Colony hybridization technique is employed for
   (a)Selection of vector (b)Unhybridised ones (c)Selection of desirable clones (d)None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation (b) Microinjection
   (c) Transformation (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus (b) Thermus aquaticus
   (c) Thermobacter aquaticus(d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot (b) Northern blot (c) Western blot (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or
   (b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or
   (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or
   (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or
   (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or
   (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or
   (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
   (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
   (b) How will you identify the presence of r DNA in a cell?.
20. (a) Explain Southern blotting technique and its applications. Or
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs
maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) ------------- are broad spectrum antiviral products
   a) Histones  b)IFN  c) Streptomycin  d)Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c)Xanthococcus  d) Zymomonas
3) ------------- is involved in the fusion of myloma cells with spleen cells
   a) PEG  b)PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as ------------
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) -------------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is ------------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c)Dinosaurs  d) Mice
8) ------------ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology   d) b and c
9) ------------ marker are involved in DNA Fingerprinting
   a) VNTR   b) RFLP     c) RAPD     d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter        c) James Watson       d) Hunkapillar

SECTION – B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
    b) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotypic vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application and development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development - explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19a) Discuss methodologies involved in the creation of transgenic mice also add
     brief note on its application (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs              Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement    c. pilot scale     d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer   c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in ___________ fermentation.
   a. batch       b. fed-batch   c. continuous     d. all

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs              Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement    c. pilot scale     d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer   c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in ___________ fermentation.
   a. batch       b. fed-batch   c. continuous     d. all
4. Batch culture is a________________
   a. open culture system   b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system

5. Streptomycin fermentation by S. griseus produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product

6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag   b. log   c. stationary   d. decline

7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore   b. Massachusetts Institute of technology
   c. MTCC   d. Imperial chemical Industries.

8. __________ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal

9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control   c. sterilization   d. packaging

10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid   c. both   d. none

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. Discuss the significance of microbes in the production of commercially important products.
    (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture   (or)
    .b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.   (or)
    .b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making   (or)
    .b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.   (or)
    .b. Write short notes on batch filters that are employed in down streaming processing.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Give a detailed account on the various methods of strain improvement   (or)
    b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.   (or)
    b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.   (or)
    b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.   (or)
    b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.   (or)
    b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) ------------ is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an an example for ------------ degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) ------------ is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as -------- in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability ------------ number of E.coli can present in 100 ml of water
   a) 1  b) 0  c) 10  d) 100

9) Application of alum is in -------- phase of water treatment

10) Super Bug was developed and patented by --------
    a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?
   (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) M. Theiler

2. The spikes are otherwise
   (a) Peplomers (b) Capsid (c) Envelope (d) Coat

3. The one step growth experiment was developed by
   (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) Max Delbruck and Emory Ellis

4. Single stranded DNA phage is
   (a) T4 phage (b) MS2 (c) QB (d) OX 174

5. The process of release of the prophage from the bacterial DNA is called
   (a) Conduction (b) Transfection (c) Insertion (d) Induction

6. The int gene codes for the synthesis of an enzyme
   (a) Integrase (b) Ligase (c) Excisionase (d) Replicase

7. TMV has a Linked transport of two substances in the same direction is called
   (a) Non – infectious ss RNA (b) Infectious ss RNA
   (c) Non – infectious ss DNA (d) Infectious ss DNA

8. Plant viruses penetrate the host cells through
   (a) Endodesmata (b) Pore (c) Echodesmata (d) None of the above

9. In Herpes viridae the viral envelope adsorbs to the receptors on
   (a) Plasma membrane (b) Cytoplasm (c) Nucleus (d) None of the above

10. For measles, the immunogen is
    (a) Active but attenuated (b) Inactive but attenuated (c) Inactive heat killed (d) Inactivated

SECTION B (5X6 = 30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or
    (b) Write a note on viral envelopes and enzymes.

12. (a) Explain the one step growth experiment. Or
    (b) Give an account on the structure of a typical bacterial virus.

13. (a) Give an account on reproduction of RNA phage. Or
    (b) Describe lysogenic conversion and its significance.

14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or
    (b) Write a note on characteristics of the viruses that infect algae and fungi.

15. (a) Write short notes on AIDS. Or
    (b) Give a brief outline on Rubella virus.

SECTION C (5X12 = 60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or
    (b) Give a brief account on the early development of virology.

17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or
    (b) Give a detailed account on ss DNA phage.

18. (a) Describe the temperate bacteriophages and lysogeny. Or
    (b) Give a brief account on generation of defective phages and their uses.

19. (a) Explain briefly the reproduction of plant viruses. Or
    (b) Give a detailed account on viruses and cancer.

20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or
    (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs          Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. An example of zoonotic disease a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called a. immune  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
5. Spot the Gram positive anaerobic endospore forming bacillus a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae a. SS agar  b. BSA  c. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is a. faeces  b. urine  c. sputum  d. blood

SECTION – B(5X5=25Marks) - Answer ALL Questions.
11.a. Define and differentiate carriers. (or)
       b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)
       b. Give the features of B.anthracs
13.a. Describe the methods for diagnosis to tetanus (or)
       b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)
       b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidiae. (or)
       b. Give the features of Rickettsiae.

SECTION – C(5X8=40Marks) - Answer ALL Questions.
16.a. Elucidate the methods of transmission of infection with examples. (or)
       b. As a microbiologist how would you take up an investigation of epidemics? Add a note
       on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How
       would you diagnose the same? (or)
       b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
       b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
       b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
       b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha b) Mycelium c) Mould d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci b) P. notatum c) Rhizopus d) Mucor

3. Candidosis is caused mainly by ________________
   a) C. albicans b) C. tropicalis c) C. pseudotropicalis d) C. krusei

4. The major organism which causes urinary tract infection is ________________
   a) E. coli b) Salmonella c) Shigella d) Klebsiella

5. Traveller's diarrhea is caused by ________________
   a) Enteropathogenic E. coli b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli d) Enterotoxigenic E.coli

6. Blue pus is caused by ______ a) Pseudomonas b) Vibrio c) Salmonella d) E. Coli

7. Sexually transmitted disease is caused by ________________
   a) Treponema b) Klebsiella c) Proteus d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as ________________
   a) Septicemia b) bacteremia c) Viremia d) Algemia

9. MIC denotes ________________
   a) Maximum inhibitory concentration b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration d) None of the above

10. Endoflagella is a characteristic nature present in ________________
    a) Spirochetes b) Salmonella c) Proteus d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium  (or) b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or) b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16.a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17. a) Describe Trichus trichura  (or)
    b) Comment on Wucheraria bancrofti

18.a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis (or) b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients’ blood and body fluid specimens.
   d) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuart’s medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION B (5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
   b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
   b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
   b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
   b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens?(OR)
   b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine.  b) Mid stream urine  c) Urine form catheter bag  d) Early morning urine sample

2. All the following are acid fast except,
   a) *Mycobacterium*  b) *Actinomycetes*  c) *Nocardia*  d) *Staphylococci*

3. The common medium used for growing *M tuberculos*s is
   a) Blood agar  b) Mac conkey agar  c) Lowenstein Jensen’s medium  d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC+++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Klebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*

5. Selective medium for *Staphylococci* is
   a) EMB agar  b) BSA  c) MSA  d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm

7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion  
   c) have circulating anti A and B antibodies  d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None

10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe? Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify
a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum  
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica  b) Entamoeba coil  c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs.  b) Larvae penetrating through the skin
   b)  c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing
    another resident from feeding the flocks of pigeons that regularly visited the area.
    Microbiologically was this action justified? Why? (OR)

b) Name the different media used for fungal pathogen isolation and identification.

12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)

b) Add a note on media for parasite isolation.

13. a) Why do most protozoan diseases occur in the tropics. (OR)

b) How do infections caused by Entamoeba histolytica occur?

14. a) Explain why antibiotics are not effective against viral infections. Advise a person about
    what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)

b) Describe some clinical manifestations caused by the acute respiratory viruses.

15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)

b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing.(OR)
   b) Name the specimen collected for dermatophytooses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male?(OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium*. (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the **B.Sc., Microbiology** degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A:** Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester.

**Group B:** allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C:** application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D:** field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) Co-Curricular activities: NSS/NCC/Physical education
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows:

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

a) A candidate will be permitted to appear for the university examinations for any semester if
   i) He/she secures not less than 75% of attendance in the number of working days during the semester.
   ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and
   iii) His/her conduct has been satisfactory.

Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**
   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**
   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**
   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**
   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**
    a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

    b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

    (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

    (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   
i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.

ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.

iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.

   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for part III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/ change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
## SCHEME OF EXAMINATIONS

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Total

B.Sc., Microbiology
Diploma in Diagnostic Microbiology

3200

400

* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_),Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique-- Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour,Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaeabacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms– colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria–Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB- Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I
Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II

UNIT –III

UNIT- IV
Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V
Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT -III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA–replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References


SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT - III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT - IV

Fermented food – pickled cucumber, saurkraut, soysauce, Bread, Idli – Fermented dairy products – Yoghurt and cheese.

UNIT - V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References

SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application,- Microarray.

References


SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development-Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles andApplications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I

Early development of virology – general properties of viruses- cultivation of Viruses- virus purification and assays. The structure of viruses- virion size-
General structure properties- helical capsids, icosohedral capsid- nucleic acids-
Viral envelopes and enzymes- virus classification.

UNIT- II

Reproduction of DNA phages- ds DNA lytic phages- lytic cycle of T4 phage
The one step growth- adsorption to the host cell and penetration- synthesis of Phage nucleic acids and protein assembly of phage particles- release of phage particles. Example of ss DNA phage- OX 174- circle replication.

UNIT-III

Lysogeny- temperate bacteriophages- lambda phage- induction of lysogens-

UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A.B).
Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References
UNIT - I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT - II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diphtheriae.

UNIT - III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- Clostridium perfringens, Clostridium tetani.

UNIT - IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydia, Rickettsiae.

References
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT - I

UNIT - II

UNIT - III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT - IV
Pyogenic infections- *Staphylococcus* and *Pseudomonas*: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT - V

References
SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus and Streptococcus pyogenes.*
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia.*
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT – I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectorophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1 Gram’s Staining
   2.2 Motility
   2.3 Culturing techniques – McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar

DIPLOMA PRACTICAL –II

1. Slide agglutination – Blood grouping
2. Tube agglutination – WIDAL
3. Precipitation – RPR
4. Immunodiffusion – Radial, Ouchterlony’s
5. Immunoelectrophoresis – Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi – LCB or KOH mount
10. Observation of parasites – Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs

Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert koch  b) Louis Pasteur  c) Antony Von Leewenhock  d) Both b & c

2) Immunity mediated by antibodies are called as _________________
   a) Humoral  b) Cell mediated  c) Active  c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) _____________ is used as a counter stain in spare staining
   a) Safranin  b) Methylene blue  c) Malachite green  d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP  b) TDT  c) D  d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um  b) 0.3 um  c) 0.4 um  d) 0.5 um

7) McIntosh fildes jar method is used for cultivating _______________
   a) Aerobic organisms  b) Anaerobic organisms  c) Facultative anaerobic organisms  d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar  b) EMB agar  c) Both a & b  d) None of the above.

9) TVC refers to ____________
   a) Total viable count  b) Total viral count  c) Total viable colony  c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant  b) Agar slant  c) Mineral oil overlay  d) a,b & c.

SECTION-B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theory of disease and to the treatment or prevention of diseases.  (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope  (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave.  (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques.  (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes.  (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - AnswerALLQuestions.

16) a) Describe spontaneous generation theory. (or)
    b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
    b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
    b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
    b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
    b) Describe the types of long term preservation of cultures.

CORE PAPER II -MICROBIAL DIVERSITY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain  (b) Genus  (c) Species  (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram  (b) Similarity matrix  (c) Dendrogram  (d) None of the above
3. Which of the following is a motile bacterium
   (a) Esherichia coli  (b) Klebsiella  (c) Bacillus subtilis  (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall  (b) Colonies have fried egg appearance  (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast  (b) Plastid  (c) Thylakoid  (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens  (b) Halophiles  (c) Thermophiles  (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores  (b) Zygosporae  (c) Basidiospores  (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores  (b) Zygosporae  (c) Conidiospores  (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae  (b) Green algae  (c) Blue green algae  (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall  (b) Move by flagella/pseudopodia
    (c) Unicellular  (d) Some are pathogens
SECTION-B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.
14. (a) Explain the life cycle of Mucor. Or (b) Describe briefly the life cycle of Dictyostelium.
15. (a) Give a brief account of pseudopodia. Or (b) Explain the general characters and the importance of Euglenophyta.

SECTION-C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach? Or (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or (b) Give a detailed account of Bergey's manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples.
19. (a) Discuss in detail the general characteristics of fungi. Or (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or (b) Explain the general characters of sporozoan with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The chemical nature of Gram negative bacteria
(a) Peptidoglycan (b) Lipopolysaccharide
(c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds
2. Polarly flagellated bacteria is known as
(a) Lophotrichous (b) Peritrichous
(c) Atrichous (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaeabacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

SECTION – B (5X6=30Marks) - Answer ALL Questions.
11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
     (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
     (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
     (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaeabacteria. Or
     (b) What are methanogens? Exemplify the role with examples.

SECTION – C (5X12=60Marks)
Answer ALL Questions.
16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water                    (b) Pigments              (c) Light                    (d) H2S
2. *Thiobacillus thiooxidans* is an example of--------
   (a) Chemoautotrophs           (b) Heterotrophs         (c) Photoautotrophs        (d) Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant             (b) Barotolerant         (c) Psychrophilic           (d) Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture     (b) Batch culture        (c) Continuous culture     (d) Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid             (b) Fumaric acid        (c) Lactic acid            (d) Ketoglutaric acid
6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP                     (b) ED                   (c) HMP                     (d) TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound       (b) Oxygen                (c) Nitrogenous compound    (d) Carbon dioxide
8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae* (b) *Chlorella sp* (c) *Klebsiella sp* (d) *Escherichia coli*
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water                  (b) Sunlight             (c) H2S                     (d) O2
10. The carrier molecule in cell-wall biosynthesis is a----
   (a) Lipid                  (b) Carbohydrate        (c) Protein                (d) None of the above

SECTION B (5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.
13. (a) Giving suitable example, describe substrate level phosphorylation. Or
    (b) Describe ED pathway.
14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a) What is anoxygenic photosynthesis? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION C (5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria. Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with CO₂ as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
(b) Describe the C₃ pathway of CO₂ fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization   b. moist air sterilization   c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization   b. incineration   c. autoclave   d. oven.
3. Lyophilization is the
   a. separation of proteins   b. sudden freezing and dehydration   c. enzyme reaction by oxidation   d. high pressure–segmentation.
4. The pH is defined as
   a. logH⁺   b. log₂H⁺   c. -logH⁺   d. -log₂H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution   b. lead sulphate   c. anions   d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid   b. lipid   c. protein   d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solutio   b. nucleic acid   c. proteins   d. enzymes.
8. NPK analysis is done using
   a. electrophoresi   b. centrifugation.   c. flame photo   d. chromatography.
9. The pH of the blood is
   a. 6.3   b. 7.4   c. 7.0   d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
     b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
     b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
     b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
   b. Write a note on NPK analysis.
15.a) The specific volume of solid ammonium sulphate is 0.565ml/g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
   b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

   SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Discuss the principle, types and applications of centrifuge. (or)
   b. Describe the instruments used for wet and dry sterilization.
17.a. Describe the different types of biosensors and their applications. (or)
   b. What is lyophilization? How is it done in the laboratory? What are its applications?
18.a. Explain Ion exchange chromatography. (or)
   b. Discuss the principle and methodology of affinity chromatography.
19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
   b. Discuss the principle and applications of turbidometry.
20.a. What is a buffer solution? State the common buffer compounds used in biology.
   with their applications (or)
   b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) Experiments was conducted in -------- to prove that the RNA also act as genetic material
   a) TMV   b) Retrovirus   c) Pox   d) Bacteriophage
2) Which form of DNA is prevalent in living cells?
   a) A   b) B   c) C   d) Z
3) -----------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase   b) helicase   c)polymerase   d) primase
4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad   b) Tautam &Lederberg   c) Meselson &stahl   d) Hershey & Chase
5) ----------- no of codons constitute the coding dictionary
   a) 64   b) 61   c) 62   d) 60
6) CAP is involved in---------?
   a) Catabolic repression  b) Induction  c) feed back inhibition   d) None of these
7) ---------is an example for intercalating agent?
   a) Acridine orange b) EMS  c) Nitrous oxide  d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair d) all of the above
9) Davis-u-tube expt is used to prove the existance of--------?
   a) Transformation  b) conjugation  c) transduction d) recombination
10) Transformation was proved and demonstrated by-----
     a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA   OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment  OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code  OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test  OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction  OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?      OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli  OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?  OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene  OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) ________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to ______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ______
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ________________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Giva a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C (5X12=60 Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or) b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or) b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) amino acids
2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min  (b) 62.5°C, 30 min  (c) 71.7°C, 15 sec  (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus  (b) Bacillus  (c) Saccharomyces  (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer  (b) sauerkraut  (c) soft drinks  (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather  (b) springer  (c) flipper  (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce  (b) yoghurt  (c) bread  (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides  (b) Streptococcus faecalis  (c) Pediococcus cerevisiae  (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample  (b) storage of sample at room temperature for 24 hr  (c) gathering information  (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin  (b) a neurotoxin  (c) a hepatotoxin  (d) a nephrotoxin.

SECTION B (5 x 6 = 30 Marks) - Answer ALL Questions.

11a) What is the significance of molds in food microbiology? Describe. (or)
    b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
    b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
    b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
    b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria.  (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples  (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation.  (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables  (or)
b) Discuss the biological spoilage of canned foods.
19) a) How is pickled cucumbers prepared? Describe . Add a note on the defects.  (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins ? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs  Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI  (b) EcoRI    (c) HindIII    (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase   (b) E.coli ligase    (c) Sal ligase    (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA   (b) Protein   (c) Phosphatase    (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosal   (b) Double stranded   (c) Self  replicating   (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid    (b) Phage lambda    (c)M13 Phage    (d) Yeast plasmid
6. Cosmid  are novel vector that combines the features of
   (a) Phage    (b) Plasmid    (c) Plasmid and phage    (d) Fungi.
7. Colony  hybridization technique is employed for
   (a)Selection of vector    (b)Unhybridised ones   (c)Selection of desirable clones (d)None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation    (b) Microinjection    (c) Transformation    (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus  (b) Thermus aquaticus    (c) Thermobacter aquaticus(d) Thermus aquatica
10.  Hybridization technique used to detect protein in a gel is
    (a) Southern blot  (b) Northern blot  (c) Western blot    (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or 
(b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or 
(b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or 
(b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or 
(b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or 
(b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or 
(b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or 
(b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or 
(b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or 
(b) How will you identify the presence of r DNA in a cell?.
20. (a) Explain Southern blotting technique and its applications. Or 
(b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs
aximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) --------- are broad spectrum antiviral products
   a) Histones   b) IFN    c) Streptomycin   d) Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida   b) Xanthomonas campestris   c) Xanthococcus   d) Zymomonas
3) --------- is involved in the fusion of myloma cells with spleen cells
   a) PEG    b) PGA   c) IPTG   d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as ---------
   a) Subunit   b) Whole cell   c) Antiidiotype   d) Peptide
5) ----------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes   b) Right border   c) Left border   d) IAA
6) Nopaline is ---------
   a) Unusual Amino acid   b) Nucleotide   c) Vitamin   d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey   b) Snake   c) Dinosaurs   d) Mice
8)  ___________ method is involved development of transgenic animal
   a) Microinjection   b) Protoplast fusion   c) Hybridoma technology   d) b and c
9)  ___________ marker are involved in DNA Fingerprinting
   a) VNTR   b) RFLP   c) RAPD   d) STR3
10) Father of HGP
    a) Francis Collins   b) Venter   c) James Watson   d) Hunkapillar

SECTION–B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
    d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application and development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION–C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening   b. strain improvement   c. pilot scale   d. commercial operation
2. Glutamic acid is used for
   a. feed supplement   b. flavour enhancer   c. ethanol production   d. antibiotic fermentation
3. Steady state is achieved in ____________ fermentation.
   a. batch   b. fed-batch   c. continuous   d. all
4. Batch culture is a________________
   a. open culture system       b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system
5. Streptomycin fermentation by S. griseus produces
   a. Vitamin B2 as a by product  b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. log                      b. stationary     c. decline
7. The term single –cell protein was coined at--------- in 1966
   a. CFTRI, Mysore             b. Massachusetts Institute of technology
   c. MTCC                      d. Imperial chemical Industries.
8. ________________ was at one time the most important substrate for SCP production
   a. methanol       b. methane   c. oil      d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery     b. quality control   c. sterilization   d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid    b. amino acid   c. both   d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**
11.a. Discuss the significance of microbes in the production of commercially important products.
     (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture      (or)
      b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.      (or)
      b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making      (or)
      b. Write about single cell protein.
15.a. Discuss the methods disruption of cells by physical methods.      (or)
      b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**
16.a. Give a detailed account on the various methods of strain improvement    (or)
      b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.    (or)
      b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.    (or)
      b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.    (or)
      b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.    (or)
      b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) ---------------- is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an an example for ----------- degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) ---------------- is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as ---------- in the nodules
   a) Protoplast  b) Bacterioiides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability ----------- number of E.coli can present in 100 ml of water
   a) 1  b) 0  c) 10  d) 100

9) Application of alum is in --------- phase of water treatment

10) Super Bug was developed and patented by ----------
    a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION - B (5X6=30 Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION - C (5X12=60 Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs

SECTION A (10 x 1=10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?  (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) M. Theiler
2. The spikes are otherwise (a) Peplomers (b) Capsid (c) Envelope (d) Coat
3. The one step growth experiment was developed by (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is (a) T4 phage (b) MS2 (c) QB (d) OX 174
5. The process of release of the prophage from the bacterial DNA is called (a) Conduction (b) Transfection (c) Insertion (d) Induction
6. The int gene codes for the synthesis of an __________-enzyme (a) Integrase (b) Ligase (c) Excisionase (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA (b) Infectious ss RNA (c) Non – infectious ss DNA (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through (a) Endodesmata (b) Pore (c) Echodesmata (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane (b) cytoplasm (c) Nucleus (d) None of the above
10. For measles, the immunogen is (a) Active but attenuated (b) Inactive but attenuated (c) Inactive heat killed (d) Inactivated

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or (b) Give a brief outline on Rubella virus.

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenecity and laboratory diagnosis of Hepatitis B virus. Or (b) Explain the pathogenecity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs  Maximum – 75 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease
   a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called
   a. immuned  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococi  b. staphylococci  c. Pseudomonas  d. Vibrio
4. Toxigenecity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by
   a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with
   a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar  b. BSA  d. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces  b. urine  c. sputum  d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a. Define and differentiate carriers.  (or)
    b. State Koch postulates.
12. a. Give the features of Streptococcus.  (or)
    b. Give the features of B.anthracs
13. a. Describe the methods for diagnosis to tetanus  (or)
    b. Describe the methods for diagnosis of gas gangrene.
14. a. Write a short note on enteric fever.  (or)
    b. Write a short note on bacillary dysentery.
15. a. Give the features of Chlamidiae.  (or)
    b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16. a. Elucidate the methods of transmission of infection with examples.  (or)
    b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17. a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same?  (or)
    b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18. a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani.  (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19. a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli.  (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20. a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum.  (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ______________
   a) Hypha  b) Mycelium  c) Mould  d) Fungi

2. _______________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci  b) P. notatum  c) Rhizopus  d) Mucor

3. Candidosis is caused mainly by _____________
   a) C. albicans  b) C. tropicalis  c) C. pseudotropicalis  d) C. krusei

4. The major organism which causes urinary tract infection is _____________
   a) E. coli  b) Salmonella  c) Shigella  d) Klebsiella

5. Traveller's diarrhea is caused by ______________
   a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli  d) Enterotoxigenic E. coli

6. Blue pus is caused by _______ a) Pseudomonas b) Vibrio  c) Salmonella  d) E. Coli

7. Sexually transmitted disease is caused by ______________
   a) Treponema  b) Klebsiella c) Proteus  d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as____________
   a) Septicemia  b) bacteremia  c) Viremia  d) Algemia

9. MIC denotes ______________
   a) Maximum inhibitory concentration  b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration  d) None of the above

10. Endoflagella is a characteristic nature present in ______________
    a) Spirochetes b) Salmonella  c) Proteus  d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium  (or)  b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or)  b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance  (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17. a) Describe Trichusis trichura  (or)
    b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphyloccus.

19. a) Comment on meningitis  (or)  b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C\(5\times 12=60\text{Marks}\) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of \textit{Mycobacterium tuberculosis}.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

**DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY**

\begin{center}
\textbf{Duration – 3hrs} \hspace{1cm} \textbf{Maximum – 100 Marks}
\end{center}

**SECTION A (10 x 1 = 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine  c) Urine form catheter bag  d) Early morning urine sample

2. All the following are acid fast except,
   a) \textit{Mycobacterium}  b) \textit{Actinomyces}  c) \textit{Nocardia}  d) \textit{Staphylococci}

3. The common medium used for growing \textit{M tuberculosis} is
   a) Blood agar  b) Mac conkey agar  c) Lowenstein Jensen’s medium  d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) \textit{E. coli}  b) \textit{Klebsiella pneumoniae}  c) \textit{Proteus vulgaris}  d) \textit{Pseudomonas aeruginosa}

5. Selective medium for \textit{Staphylococci} is
   a) EMB agar  b) BSA  c) MSA  d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm

7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies  d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None

10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity.(OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe? Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria  b) Protozoa  c) Virus  d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corporis  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a.) Entamoeba histolytica  b) Entamoeba coil  c) Entamoeba hartmanni  d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs  b) Larvae penetrating through the skin
   c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d)Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing
    another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was
    this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about
    what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION-C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dermatophytooses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniases in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — Piasmodium. (OR)
    b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
    b) Immunofluorescence — a technique to detect viral infections — Explain.
REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and
COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY
with Semester System
(with effect from 2007-2008)

1. **Eligibility for Admission to the Course**
Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
The course of study for the UG degree courses of all branches shall consist of the following

a) **Part - I**
Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

The subject shall be offered during the first four semesters with one examination at the end of each semester.

b) **Part – II : English**
The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

c) **Foundation Course**
The Foundation course shall comprise of two stages as follows:
   Foundation Course A : General Awareness (I & II semesters)
   Foundation Course B : Environmental Studies (III & IV semesters)

The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
   From the printed material supplied by the University - 75%
   Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A**: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme**: 
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

- A-Exemplary
- B-very good
- C-good
- D-fair
- E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**
   a) A candidate will be permitted to appear for the university examinations for any semester if
      i) He/she secures not less than 75% of attendance in the number of working days during the semester.
      
      ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and
      
      iii) His/her conduct has been satisfactory.

      Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**
   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**
   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**
   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**
   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**
   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**
   a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

   b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

   (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

   (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he/she,
   
i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
   
ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   
iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for Part III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
## SCHEME OF EXAMINATIONS

<table>
<thead>
<tr>
<th>Sem</th>
<th>Part</th>
<th>Subject and Paper</th>
<th>Instruction Hrs per week</th>
<th>Duration in Hrs</th>
<th>Max Marks</th>
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### Subject and Paper

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*NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques- Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacdpohiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and CO2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
2. Tortora, Funke and case. Microbiology , 8th edition
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT – III


UNIT – IV

Colorimetry, Turbidometry, Spectrometry – UV & Visible spectrophotometer, Flame photometry, Micronutrient analysis.

UNIT – V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References

2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA–replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radioimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

1. Kuby.J.1997 .,Immunology,W.H.Freeman,NY


SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT- IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application, -Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I
Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II
Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III
Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV

UNIT -V
DNA finger printing and its Application.

Human Genome Project and History and its Application , Bioremediation.

References
SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplasmic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT -IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles and Applications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A.B). Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References


SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of
epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
*Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis,
Corynebacterium diphtheriae.*

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive
Organisms- *Clostridium perfringens, Clostridium tetani.*

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative
organisms *Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella,
Pseudomonas, Vibrio cholerae.*

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- *Mycobacterium
Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira,
Chlamydia, Rickettsiae.*

References
1. Mackie and Mc Catney, 1994, Medical Microbiology No I and II. Churchill
Livingston, 14th edition.
Longman.
Calcutta.
Mosby Publications.
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange
Medical Publications, USA
SEMESTER - VI  
APPLICATION ORIENTED SUBJECT - II  
MEDICAL MICROBIOLOGY - II

UNIT - I  
Mycology: superficial infections- Dermatophytes- Microsporum – Trichophyton, 
Epidermophyton- Madura mycosis- Opportunistic fungal infections- Candida Albicans, Aspergillus, Mucor.

UNIT - II  
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, 
Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT - III  
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown 
Origin meningitis, diarrhea, respiratory tract infections.

UNIT - IV  
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted 
diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin 
typing.

UNIT - V  
Antibiotics and chemotherapeutic agents- Mechanism of actions – Drug 
resistance – Antimicrobial susceptibility testing- Disc diffusion- Kirby Bauer 
method.

References  

Orient Longman.

Mosby Publications.

Brothers Medical Publishers (P) Ltd.

SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus and Streptococcus pyogenes.*
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – *Bread and Vegetables*
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillum, Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia.*
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3-Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination -Blood grouping
2. Tube agglutination- WIDL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs
Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert Koch  b) Louis Pasteur  c) Antony Von Leewenhock  d) Both b & c

2) Immunity mediated by antibodies are called as ________________
   a) Humoral  b) Cell mediated  c) Active  c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) ___________ is used as a counter stain in spare staining
   a) Safranin  b) Methylene blue  c) Malachite green  d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP  b) TDT  c) D  d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um  b) 0.3 um  c) 0.4 um  d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms  b) Anaerobic organisms  c) Facultative anaerobic organisms  d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar  b) EMB agar  c) Both a & b  d) None of the above.

9) TVC refers to ____________
   a) Total viable count  b) Total viral count  c) Total viable colony  c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant  b) Agar slant  c) Mineral oil overlay  d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theroy of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discus the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II -MICROBIAL DIVERSITY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram (b) Similarity matrix (c) Dendrogram (d) None of the above
3. Which of the following is a motile bacterium
   (a) Esherichia coli (b) Klebsiella (c) Bacillus subtilis (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall (b) Colonies have fried egg appearance (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast (b) Plastid (c)Thylakoid (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens (b) Halophiles (c) Thermophiles (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores (b)Zygospores (c) Basidiospores (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores (b) Zygospores (c) Conidiospores (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae (b) Green algae (c) Blue green algae (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall (b) Move by flagella/pseudopodia
    (c) Unicellular (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain.  Or
(b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
(b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
(b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples
14. (a) Explain the life cycle of Mucor  Or
(b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or
(b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
(b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
(b) Give a detailed account of Bergeys manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
(b) Classify the photosynthetic euabacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi. Or
(b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or
(b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan  (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds  (d) other compounds
2. Polarely flagellated bacteria is known as ---------
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous  (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space

4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.

5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
   Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi

6. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion

7. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above

8. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles

9. In Archaebacteria the lipids are linked by
   (a) Monomer linkage (b) Ether linkage (c) B-1-4 linkage (d) Ionic linkage

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.

12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.

13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?

14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.

15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION-C(5X12=60Marks)
Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.

17. (a) Explain the structure and functions of Mitochondria and Chloroplast.. Or
    (b) Write a brief account on eukaryotic cell wall.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.

20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                                             Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water (b) Pigments (c) Light (d)H2S
2. *Thiobacillus thiooxidans* is an example of---------
   (a) Chemoautotrophs (b)Heterotrophs (c)Photoautotrophs (d)Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant (b) Barotolerant (c) Psychrophilic (d)Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture (b)Batch culture (c) Continous culture (d)Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid (b) Fumaric acid (c) Lactic acid(d) ketoglutaric acid
6. The two enzymes ,transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP (b) ED (c) HMP (d)TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound (b)Oxygen (c) Nitrogenous compound (d) Carbondioxide
8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae* (b)Chlorella sp (c) *Klebsiella* sp (d) *Escherichia coli*
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water (b) Sunlight (c)H2S (d) O2
10. The carrier molecule in cell- wall biosynthesis is a----
   (a) Lipid (b) Carbohydrate (c)Protein (d) None of the above

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria.   Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth.   Or
    (b) Give an account on Diauxic growth.
13. (a) Giving suitable example , describe substrate level phosphorylation.   Or
    (b) Describe ED pathway.
14. (a)describe alcoholic fermentation.   Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a)What is anoxygenic photosynthesis ? Describe.   Or
    (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - AnswerALLQuestions.

16. (a) With neat diagram , describe the event of endospore formation in bacteria.   Or
    (b) With suitable examples , classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth..   Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or (b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or (b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or (b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization  b. incineration  c. autoclave  d. oven.
3. Lyophilization is the
   a. separation of proteins  b. sudden freezing and dehydration  c. enzyme reaction by oxidation  d. high pressure–segmentation.
4. The pH is defined as
   a. logH  b. log2H  c. -logH  d. -log2H
5. Which is used as an absorbent in TLC.
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solutio  b. nucleic acid  c. proteins  d. enzymes.
8. NPK analysis is done using
   a. electrophoresi  b. centrifugation.  c. flame photo  d. chromatography.
9. The pH of the blood is
   a. 6.3  b. 7.4  c. 7.0  d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
    b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
    b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
    b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
   b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of
   ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 %
       saturated” solution to bring it to “60% saturation.”
   (or)
   b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Discuss the principle, types and applications of centrifuge. (or)
   b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
   b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
   b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-
   Visible spectrophotometer over a special colorimeter? (or)
   b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology.
   with their applications (or)
   b. Explain about the concentrations based on volume - molarity and normality. Also explain
      how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs                     Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in -------- to prove that the RNA also act as genetic
   material
   a) TMV   b) Retrovirus  c) Pox        d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A   b) B      c) C    d) Z

3) --------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase     b) helicase c)polymerase d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg c) Meselson &stahl  d) Hershey & Chase

5) -------- no of codons constitute the coding dictionary
   a) 64    b) 61     c) 62     d) 60
6) CAP is involved in----------?
   a) Catabolic repression  b) Induction  c) feed back inhibition  
   d) None of these
7) ---------is an example for intercalating agent?
   a) Acridine orange  b) EMS  c) Nitrous oxide  d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair  d) all of the above
9) Davis-u-tube expt is used to prove the existance of--------?
   a) Transformation  b) conjugation  c) transduction  d0 recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell? OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the 
       enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage? OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact 
     between cells and how it is exploited in mapping gene 
     OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given
1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock   b) Robert Kock   c) Louis Pasteur   d) Edward Jenner
2) Formation and development of red and white blood cells from stem cells is called as _______
   a) Hemopoiesis   b) Hematopoiesis   c) Hemoglobin   d) None of the above.
3) __________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody   b) Haptens   c) Adjuvants   d) Epitopes
4) __________________ is the immunoglobulin which can cross the placenta.
   a) IgA   b) IgD   c) IgM   d) IgG
5) Type I hypersensitivity is otherwise called as _________________
   a) Cell Stimulating   b) Delayed type   c) Anaphylactic   d) Toxic complex disease.
6) LATS refer to _______
   a) Lymphatic thyroid stimulator   b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator   d) None of the above.
7) The antibody causing agglutination is called as _________________
   a) Precipitin   b) Agglutinin   c) Agglutinogen   d) Agglutin
8) The antigen whose concentration is to be determined in RIA is termed as ____
   a) Ligand   b) Analyte   c) Both a & b   d) None of the above.
9) Grafts between two genetically non identical members of the same species are called as ____________
   a) Allografts   b) Autograft   c) Isograft   d) Xenograft
10) The method of transferring immunity by means of lymphoid cells is known as ____________
    a) Adoptive immunisation   b) Adaptive immunisation   c) Combined   d) None of the above.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus.
    (or)
   b) Describe phagocytosis process.
12) a) Comment on classical complement pathway.
    (or)
   b) Describe IgG antibody.
13) a) Explain type IV hypersensitivity reaction.
    (or)
   b) Comment on autoimmune disorders.
14) a) Give a brief note on RIA
    (or)
   b) Give a detailed account on hybridoma technology.
15) a) Comment on Rh blood group system.
    (or)
   b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier
    (or)
   b) Define and describe MALT.
17) a) Describe the types of immunity.
    (or)
   b) Comment on abnormal immunoglobulins
18) a) Describe the primary and secondary mediators of anaphylaxis
    (or)
   b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY
Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time
   combination of
   (a) 62.8°C, 30 min (b) 62.5°C, 30 min (c) 71.7°C, 15 sec (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus (b) Bacillus (c) Saccharomyces (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice
6. A can with a minute leak during storage is called
   (a) breather (b) springer (c) flipper (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce (b) yoghurt (c) bread (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides (b) Streptococcus faecalis
   (c) Pediococcus cerevisiae (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample (b) storage of sample at room temperature for 24 hr
   (c) gathering information (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

SECTION B (5X6=30Marks) - Answer ALL Questions.
11a) What is the significance of molds in food microbiology? Describe. (or)
    b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful
       effects.
12a) Discuss the drying process as a method of food preservation. (or)
    b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
    b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
    b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria.  
  b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.

16a) Discuss the importance of bacteria in food microbiology with suitable examples  
  b) What are the various factors that influence the growth of microorganisms in foods.

17a) Discuss the use of high temperature in food preservation.  
  b) Discuss the principles of food preservation.

18a) Write in detail about any six types of organism responsible for spoilage of vegetables  
  b) Discuss the biological spoilage of canned foods.

19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects.  
  b) With neat flow chart describe the production of cheese.

20a) Describe in detail about food borne infections caused by bacteria.  
  b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs  
Maximum – 75 Marks

RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. GAATTC is the recognition sequence of  
   (a) BamHI    (b) EcoRI    (c) HindIII    (d) HaeIII

2. An example of a ligase capable of both blunt and cohesive end ligation is  
   (a) T4 ligase    (b) E.coli ligase    (c) Sal ligase    (d) All

3. Phosphoramidite method is used for the synthesis of  
   (a) DNA    (b) Protein    (c) Phosphatase    (d) Phosphoric acid

4. Plasmids are DNA strands which are  
   (a) Extrachromosomal    (b) Double stranded    (c) Self replicating    (d) All the above

5. Insertional vectors are derived from  
   (a) Bacterial plasmid    (b) Phage lambda    (c)M13 Phage    (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of  
   (a) Phage    (b) Plasmid    (c) Plasmid and phage    (d) Fungi.

7. Colony hybridization technique is employed for  
   (a)Selection of vector    (b)Unhybridised ones    (c)Selection of desirable clones    (d)None of the above

8. The introduction of DNA into a single eukaryotic cell with a fine needle  
   (a) Electroporation    (b) Microinjection
   (c) Transformation    (d) None

9. Taq polymerase is isolated from  
   (a) Thermophilus aquaticus    (b) Thermus aquaticus
   (c) Thermobacter aquaticus(d) Thermus aquaticae

10. Hybridization technique used to detect protein in a gel is  
    (a) Southern blot    (b) Northern blot    (c) Western blot    (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. (a) Define cloning. Explain the various steps involved in cloning. Or
   (b) Explain the action of Methylases.

12. (a) Write a note on YAC. Or
   (b) Explain a typical cosmid vector.

13. (a) Give an account on cDNA synthesis. Or
   (b) How will you purify plasmid DNA?

14. (a) How alpha complementation of lac Z helps one to identify clone? Or
   (b) How will you identify a recombinant DNA by immunological assay?

15. (a) Explain Northern blotting technique. Or
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16. (a) Define restriction enzyme and add a note on classification and its uses. Or
   (b) Give a brief account on ligases.

17. (a) Explain the construction of cDNA and DNA library. Or
   (b) Explain the chemical synthesis of DNA in laboratory.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
   (b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Give a detailed account on gene transfer techniques. Or
   (b) How will you identify the presence of r DNA in a cell?

20. (a) Explain Southern blotting technique and its applications. Or
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs
aximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) ----------- are broad spectrum antiviral products
   a) Histones  b)IFN  c) Streptomycin  d)Nystatin

2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c)Xanthococcus  d) Zymomonas

3) ----------- is involved in the fusion of myloma cells with spleen cells
   a) PEG  b)PGA  c) IPTG  d) EtBr

4) Vaccines that require a carrier molecule for its activity is called as -----------
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide

5) ----------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA

6) Nopaline is -----------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme

7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c)Dinosaurs  d) Mice
8)  __________ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9)  __________ marker are involved in DNA Fingerprinting
    a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION – B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons  (or)
    d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application ad development of transgenic sheep  (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors  (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP  (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins  (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies  (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides  (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application  (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application  (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in ____________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a________________
   a. open culture system    b. system that maintains constant cell conc.
   c. system with addition of nutrients  d. closed culture system
5. Streptomycin fermentation by \textit{S. griseus} produces
   a. Vitamin B2 as a by product    b. Vitamin B12 as a by product
   c. Vitamin C as a by product    d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag    b. log    c. stationary    d. decline
7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore    b. Massachusetts Institute of technology
   c. MTCC    d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol    b. methane    c. oil    d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery    b. quality control    c. sterilization    d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid    b. amino acid    c. both    d. none

\textbf{SECTION–B(5X6=30Marks) - Answer ALL Questions.}
11.a. Discuss the significance of microbes in the production of commercially important products.
   (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture (or)
   b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production. (or)
   b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making (or)
   b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods. (or)
   b. Write short notes on batch filters that are employed in down streaming processing.

\textbf{SECTION–C(5X12=60Marks) - Answer ALL Questions.}
16.a. Give a detailed account on the various methods of strain improvement (or)
   b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor. (or)
   b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production. (or)
   b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast. (or)
   b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples. (or)
   b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) ---------------- is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an an example for ------------ degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) ---------------- is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as --------- in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability ------------ number of E.coli can present in 100 ml of water a) 1  b)0  c)10  d) 100

9) Application of alum is in -------- phase of water treatment

10) Super Bug was developed and patented by ---------
   a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
   b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
   b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
   b) Explain carbon cycle

14a) Discuss MPN technique (or)
   b) Explain Eutrophication

15a) Describe Air pollution (or)
   b) Explain the methodology involved in Microbiological Air quality

SECTION – C (5X12=60 Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
   b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
   b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
   b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
   b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
   b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?  (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) M. Theiler
2. The spikes are otherwise  (a) Peplomers  (b) Capsid  (c) Envelope  (d) Coat
3. The one step growth experiment was developed by  
   (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is  (a) T4 phage  (b) MS2  (c) QB  (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called  
   (a) Conduction  (b) Transfection  (c) Insertion  (d) Induction
6. The int gene codes for the synthesis of an enzymes  
   (a) Integrase  (b) Ligase  (c) Excisionase  (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called  
   (a) Non – infectious ss RNA  (b) Infectious ss RNA  
   (c) Non – infectious ss DNA  (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through  
   (a) Endodesmata  (b) Pore  (c) Echodesmata  (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on  
   (a) Plasma membrane  (b) cytoplasm  (c) Nucleus  (d) None of the above
10. For measles, the immunogen is  
    (a) Active but attenuated  (b) Inactive but attenuated  (c) Inactive heat killed  (d) Inactivated

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or
    (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or
    (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or
    (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or
    (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or
    (b) Give a brief outline on Rubella virus.

SECTION – C (5X12=60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or
    (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or
    (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or
    (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or
    (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or
    (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs  Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. An example of zoonotic disease  a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called a. immuned  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
5. Spot the Gram positive anaerobic endospore forming bacillus a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae a. SS agar  b. BSA  c. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is a. faeces  b. urine  c. sputum  d. blood

SECTION – B(5X5=25Marks) - Answer ALL Questions.
11.a. Define and differentiate carriers.  (or)
      b. State Koch postulates.
12.a. Give the features of Streptococcus.  (or)
      b. Give the features of B.anthracs
13.a. Describe the methods for diagnosis to tetanus  (or)
      b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever.  (or)
      b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidia.  (or)
      b. Give the features of Rickettsiae.

SECTION – C(5X8=40Marks) - Answer ALL Questions.
16.a. Elucidate the methods of transmission of infection with examples.  (or)
      b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same?  (or)
      b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani.  (or)
      b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli.  (or)
      b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum.  (or)
      b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs  Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha    b) Mycelium    c) Mould    d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci    b) P. notatum    c) Rhizopus    d) Mucor

3. Candidosis is caused mainly by ________________
   a) C. albicans    b) C. tropicalis    c) C. pseudotropicalis    d) C. krusei

4. The major organism which causes urinary tract infection is ________________
   a) E. coli    b) Salmonella    c) Shigella    d) Klebsiella

5. Traveller's diarrhea is caused by ________________
   a) Enteropathogenic E. coli    b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli    d) Enterotoxigenic E. coli

6. Blue pus is caused by ________________
   a) Pseudomonas    b) Vibrio    c) Salmonella    d) E. Coli

7. Sexually transmitted disease is caused by ________________
   a) Treponema    b) Klebsiella    c) Proteus    d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as ________________
   a) Septicemia    b) bacteremia    c) Viremia    d) Algemia

9. MIC denotes ________________
   a) Maximum inhibitory concentration    b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration    d) None of the above

10. Endoflagella is a characteristic nature present in ________________
    a) Spirochetes    b) Salmonella    c) Proteus    d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium  (or)  b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections.  (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections.  (or)  b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance  (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections  (or)
    b) Aspergillosis Describe.

17. a) Describe Trichusis trichura  (or)
    b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli  (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis  (or)  b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION B (5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine  c) Urine form catheter bag  d) Early morning urine sample

2. All the following are acid fast except,
   a) *Mycobacterium*  b) *Actinomycetes*  c) Nocardia  d) *Staphylococci*

3. The common medium used for growing *M. tuberculosis* is
   a) Blood agar  b) Mac conkey agar  c) Lowenstein Jensen’s medium  d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC+++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Klebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*

5. Selective medium for *Staphylococci* is a) EMB agar  b) BSA  c) MSA  d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm

7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies  d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None

10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity.(OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case?(OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe?
    Where can one obtain such information? In this information available for all pathogens.(OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY
Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria   b) Protozoa   c) Virus   d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus   b) Candida   c) Saccharomyces   d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon   b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic   d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium   b) Taenia saginata   c) Taenia corporis   d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica   b) Entamoeba coil   c) Entamoeba hartmanni   d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs. b) Larvae penetrating through the skin
   b) c) Ingestion of larave   d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar   b) Cell culture   c) Corn meal agar   d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA   b) IHA   c) Immunoelectrophoresis   d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg   b) HBsAg + HBcAg   c) HBsAg + Core antibody   d) HBcAg
10. Viruses are
    a) Found primarily in soil   b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar   d) Can be seen in bright field microscope.

SECTION B (5X6=30 Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics? (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dematophytooses. Is it necessary to store such specimens?
   How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium*. (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) **Part – III**

**Group A**: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) **Co-Curricular activities: NSS/NCC/Physical education**
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

a) A candidate will be permitted to appear for the university examinations for any semester if

   i) He/she secures not less than 75% of attendance in the number of working days during the semester.

   ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and

   iii) His/her conduct has been satisfactory.

Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

b) "Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree."
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

(ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

(iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**

   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an
      institution approved by/affiliated to the University or has been exempted from in the manner
      prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a
       certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**

   A candidate who qualifies for the UG degree course passing all the examinations in the
   first attempt, within the minimum period prescribed for the course of study from the date of
   admission to the course and secures I or II class shall be eligible for ranking and such ranking
   will be confined to 10 % of the total number of candidates qualified in that particular branch of
   study, subject to a maximum of 10 ranks.

   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**

   Any candidate who wishes to obtain an additional UG degree not involving any practical
   shall be permitted to do so and such candidate shall join a college in the III year of the course
   and he/she will be permitted to appear for par III alone by granting exemption form appearing
   Part I, Part II and common allied subjects (if any), already passed by the candidate. And a
   candidate desirous to obtain an additional UG degree involving practical shall be [ permitted to
   do so and such candidate shall join a college in the II year of the course and he/she be permitted
   to appear for Part III alone by granting exemption form appearing for Part I, Part II and the
   common allied subjects. If any, already passed. Such candidates should obtain exemption from
   the university by paying a fee of Rs.500/-.

14. **Evening College**

   The above regulations shall be applicable for candidates undergoing the respective
   courses in Evening Colleges also.

15. **Syllabus**

   The syllabus for various subjects shall be clearly demarcated into five viable units in each
   paper/subject.

16. **Revision of Regulations and Curriculum**

   The above Regulation and Scheme of Examinations will be in vogue without any change
   for a minimum period of three years from the date of approval of the Regulations. The
   University may revise/amend/change the Regulations and Scheme of Examinations, if found
   necessary.

17. **Transitory Provision**

   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will
   be permitted to take the Examinations under those Regulations for a period of four years i.e. up
   to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the
   Examination only under the Regulations in force at that time.
## SCHEME OF EXAMINATIONS

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* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique-- Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II
Taxanomy of Eubacteria and Actinomycetes – Detailed classification upto genus level with general characters of each group – Bergey’s Manual and its importance.

UNIT – III
Taxanomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxanomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I
Ultrastructure of Eubacteria-Cell wall – Cell membrane- Extra mural layer - Slime – Capsule –
Cytoplasmic inclusions – Mesosomes – Nuclear material – Reserve materials - Pigment – Cell
appendages – Flagella – Pili.

UNIT – II
Ultrasturcute and functions of Eukaryotic cell organelles – Cell wall – Cell membrane -
Other cell inclusions and Flagella.

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV
Transport mechanisms – Diffusion - Facilitated diffusion – Active transport – Group
translocation – Phagocytosis – Pinocytosis.

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
publishers.
Company
Eagle Works Cliffs N.J. Prentica Hall.
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic microorganisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT - III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Aenoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER – IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT - III


UNIT – IV


UNIT– V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation ( Lowry et al / Bradford )
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
determination of generation time
8. Extraction of pigments
9. Physiological characterization : Indole, MR, VP, Citrate utilization tests, Carbohydrate 
fermentation tests – TSI – H2S production – Starch hydrolysis – Catalase – Oxidase – 
Urease – Nitrate – Gelatin and Casein hydrolysis tests
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and1 Normal solutions

SEMMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & 
molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – 
Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III
Transcription in prokaryotes – genetic code – translation of proteins – regulation of gene 
expression in prokaryotes – Operon concept – lac & trp Operon.

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr 
mapping , genetic recombination.

References
Wiley & Sons,NY.
SEMMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT - III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT- IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application, - Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - II

UNIT –I
Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II
Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III
Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV

UNIT -V
DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References
SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose, Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organic wastes- sugarcane wastes-coir pith composition- composting, principles and Applications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment - Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A,B). Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II.

References
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diphtheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.

UNIT -V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydia, Rickettsiae.

References
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II

MEDICAL MICROBIOLOGY - II

UNIT - I
Mycology: superficial infections- *Dermatophytes - Microsporum* – *Trichophyton*,
*Epidermophyton - Madura mycosis* - Opportunistic fungal infections- *Candida*
*Albicans, Aspergillus, Mucor*.

UNIT - II
Parasitic diseases- *Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris*,
*Wuchereria bancrofti, Enterobius, Trichuris trichura*.

UNIT - III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown
Origin meningitis, diarrhea, respiratory tract infections.

UNIT - IV
Pyogenic infections- *Staphylococcus* and *Pseudomonas*: sexually transmitted
diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin
typing.

UNIT - V
Antibiotics and chemotherapeutic agents- Mechanism of actions – Drug
resistance – Antimicrobial susceptibility testing- Disc diffusion- Kirby Bauer
method.

References
Orient Longman.
Moshby Publications.
Brothers Medical Publishers (P) Ltd.
SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli*, *Klebsiella pneumoniae*, *Proteus*, *Salmonella*, *Shigella*, *Pseudomonas*, *Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans*, *Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus*, *Mucor*, *Penicillium*, *Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba*, *Plasmodium*, *Ascaris*, *Taenia*
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT – I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches – rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectrophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3-Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunoelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs                                                             Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert koch    b) Louis Pasteur    c) Antony Von Leewenhock    d) Both b & c

2) Immunity mediated by antibodies are called as ________________
   a) Humoral    b) Cell mediated    c) Active    c) Passive

3) ______ is the ability of a lens to separate or distinguish between small objects that are close together.

4) ___________ is used as a counter stain in spare staining
   a) Safranin    b) Methylene blue    c) Malachite green    d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP    b) TDT    c) D    d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um    b) 0.3 um    c) 0.4 um    d) 0.5 um

7) McIntosh filled jar method is used for cultivating ________________
   a) Aerobic organisms    b) Anaerobic organisms    c) Facultative anaerobic organisms    d) Microphilic organisms

8) ______________ is an example for selective media.
   a) Mac conkey agar    b) EMB agar    c) Both a & b    d) None of the above.

9) TVC refers to _______________
   a) Total viable count    b) Total viral count    c) Total viable colony    c) None of the above.

10) ______________ is an example for short term preservation of microbes.
    a) Agar slant    b) Agar slant    c) Mineral oil overlay    d) a,b & c.

SECTION-B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO2 liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain  (b) Genus  (c) Species  (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram  (b) Similarity matrix  (c) Dendrogram  (d) None of the above
3. Which of the following is a motile bacterium
   (a) Escherichia coli  (b) Klebsiella  (c) Bacillus subtilis  (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall  (b) Colonies have fried egg appearance  (c) Require sterols for growth  
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast  (b) Plastid  (c) Thylakoid  (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens  (b) Halophiles  (c) Thermophiles  (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores  (b) Zygosporas  (c) Basidiospores  (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores  (b) Zygosporas  (c) Conidiospores  (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae  (b) Green algae  (c) Blue green algae  (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall  (b) Move by flagella/pseudopodia  (c) Unicellular  (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or
    (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
    (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
    (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.
14. (a) Explain the life cycle of Mucor Or
    (b) Describe briefly the life cycle of Dictyostelium.
15. (a) Give a brief account of pseudopodia. Or
    (b) Explain the general characters and the importance of Euglenophyta.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
    (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
    (b) Give a detailed account of bergeys manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
    (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples.
19. (a) Discuss in detail the general characteristics of fungi. Or
    (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or
    (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks
SECION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan   (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds   (d) other compounds
2. Polarly flagellated bacteria is known as -------------
   (a) Lophotrichous   (b) Peritrichous
   (c) Atrichous   (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaeabacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**

11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaeabacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

**SECTION–C(5X12=60Marks)**
Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water  (b) Pigments  (c) Light  (d)H2S
2. *Thiobacillus thiooxidans* is an example of--------
   (a)Chemoautotrophs  (b)Heterotrophs  (c)Photoautotrophs  d)Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant  (b) Barotolerant  (c) Psychrophilic  (d)Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture  (b)Batch culture  (c) Continous culture  (d)Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid  (b) Fumaric acid  (c) Lactic acidInsertion  (d) ketoglutaric acid
6. The two enzymes ,transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP  (b) ED  (c) HMP  (d)TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound  (b)Oxygen  (c) Nitrogenous compound  (d) Carbon dioxide
8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*  (b)Chlorella sp  (c) Klebsiella sp  (d) *Escherichia coli*
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water  (b) Sunlight  (c)H2S  (d) O2
10. The carrier molecule in cell- wall biosynthesis is a----
    (a) Lipid  (b) Carbohydrate  (c)Protein  (d) None of the above

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria.  Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth?Explain any one method of obtaining synchronous growth.  Or
    (b)Give an account on Diauxic growth.
13. (a) Giving suitable example , describe substrate level phosphorylation.  Or
    (b) Describe ED pathway.
14. (a)describe alcoholic fermentation.  Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a)What is anoxygenic photosynthesis ? Describe.  Or
    (b) Give a brief note on Bioluminescence.

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram , describe the event of endospore formation in bacteria.  Or
    (b) With suitable examples , classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth..  Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or 
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or 
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or 
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization   b. moist air sterilization   c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization   b. incineration   c. autoclave   d. oven.
3. Lyophilization is the
   a. separation of proteins   b. sudden freezing and dehydration   c. enzyme reaction by oxidation   d. high pressure—segmentation.
4. The pH is defined as
   a. logH^+    b. log2H^+    c. -logH^+    d. -log2H^+
5. Which is used as an absorbent in TLC.
   a. KCl solution   b. lead sulphate   c. anions   d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid   b. lipid   c. protein   d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solutio   b. nucleic acid   c. proteins   d. enzymes.
8. NPK analysis is done using
   a. electrophoresi   b. centrifugation.   c. flame photo   d. chromatography.
9. The pH of the blood is
   a. 6.3   b. 7.4   c. 7.0   d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or) 
   b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or) 
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or) 
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14. a. Write down the principle and applications of Flame photometry. (or)
   b. Write a note on NPK analysis.

15. a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40% saturated” solution to bring it to “60% saturation.”

   (or)

   b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**

16. a. Discuss the principle, types and applications of centrifuge. (or)
   b. Describe the instruments used for wet and dry sterilization.

17. a. Describe the different types of biosensors and their applications. (or)
   b. What is lyophilization? How is it done in the laboratory? What are its applications?

18. a. Explain Ion exchange chromatography. (or)
   b. Discuss the principle and methodology of affinity chromatography.

19. a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
   b. Discuss the principle and applications of turbidometry.

20. a. What is a buffer solution? State the common buffer compounds used in biology.
   b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

**CORE PAPER VI - MICROBIAL GENETICS**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A ( 10 x 1= 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in -------- to prove that the RNA also act as genetic material
   a) TMV        b) Retrovirus  c) Pox        d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A          b) B          c) C        d) Z

3) --------Enzyme resolves the super coiling during replication of *E.Coli*
   a) gyrase     b) helicase   c) polymerase  d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad b) Tautam &Lederberg c) Meselson &stahl  d) Hershey & Chase

5) -------- no of codons constitute the coding dictionary
   a) 64        b) 61      c) 62      d) 60
6) CAP is involved in--------?  
   a) Catabolic repression  b) Induction c) feed back inhibition  d) None of these
7) --------is an example for intercalating agent?  
   a) Acridine orange   b) EMS  c) Nitrous oxide  d) UV
8) Lex protein are involved in ----type of repair?  
   a) SOS  b) photoreactivation  c) Exision repair d) all of the above
9) Davis-u-tube exp is used to prove the existence of--------?  
   a) Transformation  b) conjugation  c) transduction d) recombination
10) Transformation was proved and demonstrated by-----  
   a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA  OR  
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment  OR  
    b) Describe DNA polymerase
13) a) Explain the features of genetic code  OR  
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test  OR  
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction  OR  
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR  
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?  OR  
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli  OR  
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?  OR  
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene  
    OR  
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  
   b) Robert Kock  
   c) Louis Pasteur  
   d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as _______
   a) Hemopoiesis  
   b) Hematopoiesis  
   c) Hemoglobin  
   d) None of the above.

3) _______________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  
   b) Haptens  
   c) Adjuvants  
   d) Epitopes

4) _______________ is the immunoglobulin which can cross the placenta.
   a) IgA  
   b) IgD  
   c) IgM  
   d) IgG

5) Type I hypersensitivity is otherwise called as _______________
   a) Cell Stimulating  
   b) Delayed type  
   c) Anaphylactic  
   d) Toxic complex disease.

6) LATS refer to _______
   a) Lymphatic thyroid stimulator  
   b) Long acting thyroid stimulator  
   c) Lymph acting thyroid stimulator  
   d) None of the above.

7) The antibody causing agglutination is called as _______________
   a) Precipitin  
   b) Agglutinin  
   c) Agglutinogen  
   d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand  
   b) Analyte  
   c) Both a & b  
   d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ____________
   a) Allografts  
   b) Autograft  
   c) Isograft  
   d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ____________
    a) Adoptive immunisation  
    b) Adaptive immunisation  
    c) Combined  
    d) None of the above.

SECTION B (5X6 = 30 Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus.  
    (or)
   b) Describe phagocytosis process.

12) a) Comment on classical complement pathway.  
    (or)
   b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction.  
    (or)
   b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA  
    (or)
   b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system.  
    (or)
   b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION C (5X12 = 60 Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier  
    (or)
   b) Define and describe MALT.

17) a) Describe the types of immunity.  
    (or)
   b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis  
    (or)
   b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY
Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) amino acids
2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min (b) 62.5°C, 30 min (c) 71.7°C, 15 sec (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus (b) Bacillus (c) Saccharomyces (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather (b) springer (c) flipper (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce (b) yoghurt (c) bread (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides (b) Streptococcus faecalis (c) Pediococcus cerevisiae (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample (b) storage of sample at room temperature for 24 hr (c) gathering information (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

SECTION – B (5x6=30 Marks) - Answer ALL Questions.

11a) What is the significance of molds in food microbiology? Describe. (or)
   b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
   b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
   b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
   b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION – C (5X12 = 60 Marks)
Answer ALL Questions.

16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.

17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.

18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.

19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.

20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. GAATTC is the recognition sequence of
   (a) BamHI (b) EcoRI (c) HindIII (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase (b) E.coli ligase (c) Sal ligase (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA (b) Protein (c) Phosphatase (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosomal (b) Double stranded (c) Self replicating (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi.
7. Colony hybridization technique is employed for
   (a) Selection of vector (b) Unhybridised ones (c) Selection of desirable clones (d) None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation (b) Microinjection (c) Transformation (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus (b) Thermus aquaticus (c) Thermobacter aquaticus (d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot (b) Northern blot (c) Western blot (d) Eastern blot
SECTION – B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or
(b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or
(b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or
(b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or
(b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or
(b) Give an account on RAPD.

SECTION – C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or
(b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or
(b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
(b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
(b) How will you identify the presence of r DNA in a cell?.
20. (a) Explain Southern blotting technique and its applications. Or
(b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs
aximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) -------- are broad spectrum antiviral products
   a) Histones  b)IFN  c) Streptomycin  d)Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c)Xanthococcus  d) Zymomonas
3) -------- is involved in the fusion of myloma cells with spleen cells
   a) PEG  b)PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as --------
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) --------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is --------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c) Dinosaurs  d) Mice
8) ---------- method is involved development of transgenic animal
a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c

9) ------------ marker are involved in DNA Fingerprinting
a) VNTR  b) RFLP  c) RAPD  d) STR3

10) Father of HGP
a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION–B (5X5=25Marks) - Answer ALL Questions.

11a) Write a brief account on commercial biosynthesis of interferons (or)
d) List the uses Human growth hormone and brief on its commercial production

12a) Give a short note on Antidiotype vaccine (or)
b) List the uses and application of monoclonal antibodies

13a) Explain in short the application and development of transgenic sheep (or)
b) Transgenic mice; DNA microinjection method of development - explain

14a) Explain in short about Ti based cointegrate vectors (or)
b) Detail the Biochemistry and the mode of action of Bt toxin

15a) List the scope and application of HGP (or)
b) What is Bioremediation? How does r DNA technology influences it?

SECTION–C (5X8=40Marks) - Answer ALL Questions.

16a) Write an essay on the commercial synthesis of small proteins (or)
b) Discuss microbial synthesis of Biopolymers

17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
b) Explain the method and application of gene therapy

18a) Discuss about Microbial insecticides (or)
b) Elucidate methods involved in generation of insect, virus, resistant plants

19) a) Discuss methodologies involved in the creation of transgenic mice also add
b) Brief note on its application (or)

20a) Write a detailed essay on DNA Fingerprinting and its application (or)
b) Give a deailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation

2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation

3. Steady state is achieved in ______________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a________________
   a. open culture system   b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system

5. Streptomycin fermentation by S. griseus produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product

6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag       b. log       c. stationary       d. decline

7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore   b. Massachusetts Institute of technology
   c. MTCC   d. Imperial chemical Industries.

8. __________ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal

9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control   c. sterilization   d. packaging

10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid   c. both   d. none

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. Discuss the significance of microbes in the production of commercially important products.
     (or)  b. Write a short note on the isolation of alkaline protease producers from soil.

12.a. Explain briefly batch culture   (or)
     .b. Differentiate submerged and solid state fermentation.

13.a. Describe in detail fungal protease production.   (or)
     b. Discuss the methods of immobilization and add a note on its significance.

14.a. Describe the role of yeast in bread making   (or)
     b. Write about single cell protein.

15.a. Discuss the methods of disruption of cells by physical methods.   (or)
     b. Write short notes on batch filters that are employed in down stream processing.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Give a detailed account on the various methods of strain improvement   (or)
     b. Discuss the methods for screening of industrially important microorganism

17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.   (or)
     b. Give a detailed account on solid state fermentation with its applications.

18.a. Elaborate on the various steps involved in beer production.   (or)
     b. Write an essay on the commercial production in beer production.

19.a. Explain briefly the industrial application of yeast.   (or)
     b. Describe in detail the development of Oyster mushroom.

20.a. Describe in detail the recovery and purification of intracellular products with examples.   (or)
     b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhalzal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) ___________ is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an an example for __________ degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) ___________ is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as __________ in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability __________ number of E.coli can present in 100 ml of water
   a) 1  b) 0  c) 10  d) 100

9) Application of alum is in __________ phase of water treatment

10) Super Bug was developed and patented by __________
    a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION – C (5X12=60) Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV? (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) M. Theiler
2. The spikes are otherwise (a) Peplomers (b) Capsid (c) Envelope (d) Coat
3. The one step growth experiment was developed by (a) Bejerinck (b) D. Ivanowski (c) W. Stanley (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is (a) T4 phage (b) MS2 (c) QB (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called (a) Conduction (b) Transfection (c) Insertion (d) Induction
6. The int gene codes for the synthesis of an (a) Integrase (b) Ligase (c) Excisionase (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called (a) Non-infectious ss RNA (b) Infectious ss RNA (c) Non-infectious ss DNA (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through (a) Endodesmata (b) Pore (c) Echodesmata (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane (b) Cytoplasm (c) Nucleus (d) None of the above
10. For measles, the immunogen is (a) Active but attenuated (b) Inactive but attenuated (c) Inactive heat killed (d) Inactivated

SECTION B (5X6=30 Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region. Or (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment. Or (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage. Or (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell. Or (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS. Or (b) Give a brief outline on Rubella virus.

SECTION C (5X12=60 Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods. Or (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage. Or (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny. Or (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses. Or (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus. Or (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs

Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called a. immune  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
5. Spot the Gram positive anaerobic endospore forming bacillus a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae a. SS agar  b. BSA  d. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is a. faeces  b. urine  c. sputum  d. blood

SECTION-B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers. (or) b. State Koch postulates.
12.a. Give the features of Streptococcus. (or) b. Give the features of B.anthracis
13.a. Describe the methods for diagnosis to tetanus (or) b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or) b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidiae. (or) b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples. (or) b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or) b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or) b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or) b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or) b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II
Duration – 3hrs maximum – 75 Marks
SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A tangled mass of hyphae is called as ________________
   a) Hypha    b) Mycelium    c) Mould    d) Fungi
2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci  b) P. notatum  c) Rhizopus  d) Mucor
3. Candidosis is caused mainly by __________
   a) C. albicans  b) C. tropicalis  c) C. pseudotropicalis  d) C. krusei
4. The major organism which causes urinary tract infection is ____________
   a) E. coli  b) Salmonella  c) Shigella  d) Klebsiella
5. Traveller's diarrhea is caused by __________
   a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli  d) Enterotoxigenic E.coli
6. Blue pus is caused by ______ a) Pseudomonas b) Vibrio    c) Salmonella d) E. Coli
7. Sexually transmitted disease is caused by __________
   a) Treponema  b) Klebsiella c) Proteus  d) Pseudomonas
8. Invasion of microorganisms into the bloodstream is called as___________
   a) Septicemia  b) bacteremia c) Viremia  d) Algemia
9. MIC denotes __________________
   a) Maximum inhibitory concentration  b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration  d) None of the above
10. Endoflagella is a characteristic nature present in __________
    a) Spriochetes b) Salmonella  c) Proteus  d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. a) Comment on superficial infection. (or)
   b) Describe candidiasis
12. a) Comment on Taenia solium  (or)  b) Give a brief note on Ascaris.
13. a) Describe the etiology and laboratory diagnosis of urinary tract infections.  (or)
   b) Describe respiratory tract infections.
14. a) Describe briefly on pyogenic infections.  (or)  b) Comment on Pseudomonas.
15. a) Explain the mechanism of drug resistance  (or)
   b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.
16. a) Add a note on opportunistic fungal infections  (or)
    b) Aspergillosis Describe.
17. a) Describe Trichus trichura  (or)
    b) Comment on Wucheraria bancrofti
18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.
19. a) Comment on meningitis  (or)  b) Describe pyrexia
20. a) Describe drug resistance nature of bacteria  
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients’ blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium b) Glycerol saline medium c) Cary Blair medium d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne b) Ingestion c) Direct inoculation d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid b) Blood c) Semen d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol b) Sputolysin c) Sputasol d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol b) Sodium hypochlorite c) 2% Glutaraldehyde d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium b) Cooked meat medium c) Saponin broth d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA b) ELISA c) Western blot d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium b) Acid fast staining c) Animal susceptibility d) Fluorescent Microscopy.

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions.(OR)
b) Describe the procedures used for culturing anaerobic microorganisms.
17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.
18. a) Comment on the biological safety cabinets in a Microbiology laboratory.(OR)
b) How can individual pathogenic viruses be identified in the lab.
19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.
20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens?(OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs  
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag d) Early morning urine sample
2. All the following are acid fast except,
   a) *Mycobacterium*  b) *Actinomycetes*  c) *Nocardia*  d) *Staphylococci*
3. The common medium used for growing *M tuberculosis* is
   a) Blood agar  b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Klebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*
5. Selective medium for *Staphylococci* is  a) EMB agar  b) BSA  c) MSA  d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b)24mm  c)28mm  d) 30mm
7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh(D) - negative  b) are “universal recipients” of transfusion  
c) have circulating anti A and B antibodies  d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None
10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.
11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.
12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.
13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.
14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.
15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.
17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.
18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.
19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.
20. a) What information is essential for the design of a pathogen specific nucleotide probe? Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs                                                                                 Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Growth medium for fungus inhibits growth of
   a) Bacteria        b) Protozoa       c) Virus      d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus     b) Candida       c) Saccharomyces d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon       b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic      d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium        b) Taenia saginata c) Taenia corporis   d) Taenia pedis
5. Of the following organisms, which has a bigger size?
6. Hookworm infection is by
   a) Ingestion of embryonated eggs. b) Larvae penetrating through the skin
   b) Ingestion of larvae       d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar   b) Cell culture   c) Corn meal agar d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA     c) Immunoelectrophoresis d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg    b) HBsAg + HBCag  c) HBsAg + Core antibody d) HBCAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics? (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
   b) Name the specimen collected for dermatophytooses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium*. (OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.
REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY with Semester System
(with effect from 2007-2008)

1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.
      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      - From the printed material supplied by the University : 75%
      - Current affairs & who is who? : 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A**: Core subject – As prescribed in the scheme of examination. Examination will be conducted in the core subjects at the end of every semester

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) Co-Curricular activities: NSS/NCC/Physical education
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

- A-Exemplary
- B-very good
- C-good
- D-fair
- E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**
   a) A candidate will be permitted to appear for the university examinations for any semester if
   i) He/she secures not less than 75% of attendance in the number of working days during the semester.
   ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and
   iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**
   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.”
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

   a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

   b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

   (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

   (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**

No candidate shall be eligible for conferment of the Degree unless he / she,

i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.

ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.

iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**

A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.

The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**

Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-.

14. **Evening College**

The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**

The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**

The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/ change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**

Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
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* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining- Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique-- Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria - General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora ,Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I
Ultrastructure of Eubacteria-Cell wall – Cell membrane- Extra mural layer - Slime – Capsule –
Cytoplasmic inclusions – Mesosomes – Nuclear material – Reserve materials - Pigment – Cell
appendages – Flagella – Pili.

UNIT – II
Ultrasturcute and functions of Eukaryotic cell organelles – Cell wall – Cell membrane -
Other cell inclusions and Flagella.

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV
Transport mechanisms – Diffusion - Facilitated diffusion – Active transport – Group
translocation – Phagocytosis – Pinocytosis.

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacdiphiles.

References
publishers.
Company
Eagle Works Cliffs N.J. Prentica Hall..
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT -III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2.Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al./Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation ofBUFFERS – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA– replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S., 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiomune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

1. Kuby,J.1997 .,Immunology,W.H.Freeman,NY
SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT - III

Spoilage of food – cereals, vegetables, fruits, egg and milk – canned foods.

UNIT - IV

Fermented food – pickled cucumber, saurkraut, soysauce, Bread, Idli – Fermented dairy products – Yoghurt and cheese.

UNIT - V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER – V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - I

UNIT - I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT - II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT - III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT - IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants - Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT - V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application,- Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains - Screening methods - Strain development for Improved yield - Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation - submerged and solid state - component parts of a CSTR - types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose, Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles and Applications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I

Early development of virology – general properties of viruses- cultivation of Viruses- virus purification and assays. The structure of viruses- virion size-
General structure properties- helical capsids, icosohedral capsid- nucleic acids-
Viral envelopes and enzymes- virus classification.

UNIT- II

Reproduction of DNA phages- ds DNA lytic phages- lytic cycle of T4 phage
The one step growth- adsorption to the host cell and penetration- synthesis of Phage nucleic acids and protein assembly of phage particles- release of phage particles. Example of ss DNA phage- OX 174- circle replication.

UNIT-III

Lysogeny- temperate bacteriophages- lambda phage- induction of lysogens-

UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A,B).
Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References
SEMMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diptheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium Tuberculosi, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydas, Rickettsiae.

References
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II

MEDICAL MICROBIOLOGY - II

UNIT- I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancrofti, Enterobius, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References


SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli*, *Klebsiella pneumoniae*, *Proteus*, *Salmonella*, *Shigella*, *Pseudomonas*, *Staphylococcus aureus* and *Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans*, *Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus*, *Mucor*, *Penicillium*, *Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba*, *Plasmodium*, *Ascaris*, *Taenia*.
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectorophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References

SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3-Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- *Entamoeba, Plasmodium, Ascaris, Taenia*
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs                                      Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert Koch    b) Louis Pasteur    c) Antony Von Leewenhock    d) Both b & c

2) Immunity mediated by antibodies are called as ________________
   a) Humoral    b) Cell mediated    c) Active    c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) _____________ is used as a counter stain in spare staining
   a) Safranin    b) Methylene blue    c) Malachite green    d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP    b) TDT    c) D    d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um    b) 0.3 um    c) 0.4 um    d) 0.5 um

7) McIntosh filled jar method is used for cultivating ________________
   a) Aerobic organisms    b) Anaerobic organisms    c) Facultative anaerobic organisms    d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar    b) EMB agar    c) Both a & b    d) None of the above.

9) TVC refers to ____________
   a) Total viable count    b) Total viral count    c) Total viable colony    c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant    b) Agar slant    c) Mineral oil overlay    d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types
19) a) Discuss the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures

CORE PAPER II - MICROBIAL DIVERSITY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain  (b) Genus  (c) Species  (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram  (b) Similarity matrix  (c) Dendrogram  (d) None of the above
3. Which of the following is a motile bacterium
   (a) Escherichia coli  (b) Klebsiella  (c) Bacillus subtilis  (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cell wall  (b) Colonies have fried egg appearance  (c) Require sterols for growth  
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast  (b) Plastid  (c) Thylakoid  (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens  (b) Halophiles  (c) Thermophiles  (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores  (b) Zygospores  (c) Basidiospores  (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores  (b) Zygospores  (c) Conidiospores  (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae  (b) Green algae  (c) Blue green algae  (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cell wall  (b) Move by flagella/pseudopodia  
    (c) Unicellular  (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples.
14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach?
   Or
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of Bergey's manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples.
19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Chlorophyta and phaeophyta. Or
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY
Duration – 3hrs   Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan    (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide + compounds    (d) other compounds
2. Polarly flagellated bacteria is known as ----------
   (a) Lophotrichous    (b) Peritrichous
   (c) Atrichous        (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B-1-4 linkage (d) Ionic linkage

SECTION – B (5X6=30Marks) - Answer ALL Questions.
11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION – C (5X12=60Marks)
Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water          (b) Pigments       (c) Light         (d)H2S

2. *Thiobacillus thiooxidans* is an example of----------
   (a)Chemoautotrophs   (b)Heterotrophs   (c)Photoautotrophs   d)Copiotrophs

3. The organisms which tolerate high pressure are called
   (a) Halotolerant      (b) Barotolerant   (c) Psychrophilic     (d)Thermotolerant

4. Chemostat is associated with
   (a) Synchronous culture (b)Batch culture      (c) Continous culture (d)Diauxic growth

5. All the following are intermediates of TCA cycle except
   (a) Citric acid     (b) Fumaric acid    (c) Lactic acid    (d) ketoglutaric acid

6. The two enzymes ,transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP     (b) ED          (c) HMP     (d)TCA cycle

7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound (b)Oxygen       (c) Nitrogenous compound      (d) Carbondioxide

8. Which of the following carries out mixed acid fermentation?
   (a) Saccharomyces cerevisiae (b)Chlorella sp (c) Klebsiella sp (d) Escherichia coli

9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water        (b) Sunlight       (c)H2S       (d) O2

10. The carrier molecule in cell- wall biosynthesis is a----
    (a) Lipid        (b) Carbohydrate   (c)Protein        (d) None of the above

SECTION –B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria.   Or
    (b) What are copiotrophs? Describe with suitable examples.

12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b)Give an account on Diauxic growth.

13. (a) Giving suitable example , describe substrate level phosphorylation.   Or
    (b) Describe ED pathway.

14. (a)describe alcoholic fermentation.   Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.

15. (a)What is anoxygenic photosynthesis ? Describe.   Or
    (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram , describe the event of endospore formation in bacteria. Or
    (b) With suitable examples , classify bacteria based on their nutritional requirements.

17. (a) Discuss in detail the different phases of growth.. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or 
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or 
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.

2. Moist heat sterilization is achieved by
   a. lyophilization  b. incineration  c. autoclave  d. oven.

3. Lyophilization is the
   a. separation of proteins  b. sudden freezing and dehydration  c. enzyme reaction by oxidation  d. high pressure–segmentation.

4. The pH is defined as
   a. logH^+  b. log2H^+  c. -logH^+  d. -log2H^+

5. Which is used as an absorbent in TLC.
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel

6. SDS-PAGE is used to separate
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.

7. UV light is significantly absorbed by
   a. coloured solution  b. nucleic acid  c. proteins  d. enzymes.

8. NPK analysis is done using
   a. electrophoresis  b. centrifugation  c. flame photo  d. chromatography.

9. The pH of the blood is
   a. 6.3  b. 7.4  c. 7.0  d. 7.6

10. What is the normality of 5M NaOH solution?

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
11.b. Explain the working of an incubator.

12.a. Explain the electrodes used in pH measurement. (or)
12.b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.

13.a. What is paper chromatography? (or)
13.b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology.
   with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV b) Retrovirus c) Pox d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A b) B c) C d) Z

3) ----------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase b) helicase c)polymerase d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad b) Tautam &Lederberg c) Meselson &stahl d) Hershey & Chase

5) ---------- no of codons constitute the coding dictionary
   a) 64 b) 61 c) 62 d) 60
6) CAP is involved in----------?
   a) Catabolic repression  b) Induction c) feed back inhibition  d) None of these
7) ---------is an example for intercalating agent?
   a) Acridine orange  b) EMS  c) Nitrous oxide  d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair d) all of the above
9) Davis-u-tube exp is used to prove the existance of--------?
   a) Transformation  b) conjugation  c) transduction d) recombination
10) Transformation was proved and demonstrated by-----
   a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA  OR  
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment  OR  
    b) Describe DNA polymerase
13) a) Explain the features of genetic code  OR  
    b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test  OR  
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction  OR  
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR  
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?  OR  
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli  OR  
    b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?  OR  
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene  OR  
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as ________
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) ___________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ___________________ is the immunoglobin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to ________
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as __________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as __________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as __________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION – B (5X6 = 30 Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C (5X12 = 60 Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

**CORE PAPER VIII - FOOD MICROBIOLOGY**

**Duration – 3hrs**

**Maximum – 100 Marks**

**SECTION A (10 x 1 = 10 Marks)**

Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti  (b) pyruvic acid  (c) fumaric acid  (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) *Serratia*  (b) *Flavobacterium*  (c) *Micrococcus*  (d) *Klebsiella*
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min  (b) 62.5°C, 30 min  (c) 71.7°C, 15 sec  (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) *Aspergillus*  (b) *Bacillus*  (c) *Saccharomyces*  (d) *Serratia*
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer  (b) sauerkraut  (c) soft drinks  (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather  (b) springer  (c) flipper  (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce  (b) yoghurt  (c) bread  (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) *Leuconostoc mesenteroides*  (b) *Streptococcus faecalis*  
   (c) *Pediococcus cerevisiae*  (d) *Staphylococcus aureus*
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample  (b) storage of sample at room temperature for 24 hr
   (c) gathering information  (d) laboratory testing
10. The toxin produced by *Staphylococcus* sp in food is
    (a) an enterotoxin  (b) a neurotoxin  (c) a hepatotoxin  (d) a nephrotoxin.

**SECTION B (5X6 = 30 Marks) - Answer ALL Questions.**

11a) What is the significance of molds in food microbiology? Describe. (or)
    b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
    b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
    b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
    b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.
19 a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI (b) EcoRI (c) HindIII (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase (b) E.coli ligase (c) Sal ligase (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA (b) Protein (c) Phosphatase (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosomal (b) Double stranded (c) Self replicating (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c)M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi.
7. Colony hybridization technique is employed for
   (a) Selection of vector (b) Unhybridised ones (c) Selection of desirable clones (d) None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation (b) Microinjection (c) Transformation (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus (b) Thermus aquaticus
   (c) Thermobacter aquaticus (d) Thermus aquatica
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot (b) Northern blot (c) Western blot (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning.   
   (b) Explain the action of Methylases.
12. (a) Write a note on YAC.   
   (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis.   
   (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone?   
   (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique.   
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses.   
   (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library.   
   (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.   
   (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques.   
   (b) How will you identify the presence of r DNA in a cell?.
20. (a) Explain Southern blotting technique and its applications.   
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs    aximum – 75 Marks

SECTION A ( 10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) ----------- are broad spectrum antiviral products
   a) Histones   b) IFN   c) Streptomycin   d) Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida   b) Xanthomonas campestris   c) Xanthococcus   d) Zymomonas
3) ----------- is involved in the fusion of myloma cells with spleen cells
   a) PEG   b) PGA   c) IPTG   d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as -----------
   a) Subunit   b) Whole cell   c) Antiidiotype   d) Peptide
5) ----------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes   b) Right border   c) Left border   d) IAA
6) Nopaline is -----------
   a) Unusual Amino acid   b) Nucleotide   c) Vitamin   d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey   b) Snake   c) Dinosaurs   d) Mice
8) ------------ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) ------------ marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3

10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION–B(5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
    d) List the us Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application and development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION–C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19) a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in ______________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a ______________
   a. open culture system    b. system that maintains constant cell conc.
   c. system with addition of nutrients    d. closed culture system

5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product    b. Vitamin B12 as a by product
   c. Vitamin C as a by product    d. Biotin as a by product

6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag    b. log    c. stationary    d. decline

7. The term single –cell protein was coined at------------ in 1966
   a. CFTRI, Mysore    b. Massachusetts Institute of technology
   c. MTCC    d. Imperial chemical Industries.

8. __________ was at one time the most important substrate for SCP production
   a. methanol    b. methane    c. oil    d. coal

9. Which of the following steps does not come under down stream processing
   a. product recovery    b. quality control    c. sterilization    d. packaging

10. Crystallization is an established method employed in the initial recovery of
    a. organic acid    b. amino acid    c. both    d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**

11.a. Discuss the significance of microbes in the production of commercially important  products.
      (or)  b. Write a short note on the isolation of alkaline protease producers from soil.

12.a. Explain briefly batch culture   (or)
      b. Differentiate submerged and solid state fermentation.

13.a. Describe in detail fungal protease production.   (or)
      b. Discuss the methods of immobilization and add a note on its significance.

14.a. Describe the role of yeast in bread making   (or)
      b. Write about single cell protein.

15.a. Discuss the methods distruption of cells by physical methods.   (or)
      b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**

16.a. Give a detailed account on the various methods of strain improvement   (or)
      b. Discuss the methods for screening of industrially important microorganism

17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.   (or)
      b. Give a detailed account on solid state fermentation with its applications.

18.a. Elaborate on the various steps involved in beer production.   (or)
      b. Write an essay on the commercial production in beer production.

19.a. Explain briefly the industrial application of yeast.   (or)
      b. Describe in detail the development of Oyster mushroom.

20.a. Describe in detail the recovery and purification of intracellular products with examples.   (or)
      b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs  
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is  
a) Ammensalism  
b) Commensalism  
c) Parasitism  
d) Synergism

2) Mycorhizal association is an example of  
a) Ammensalism  
b) Commensalism  
c) Parasitism  
d) Symbiosis

3) -------------------- is an example of recalcitrant compound  
a) Lignin  
b) Protein  
c) Carbohydrate  
d) Lipid

4) Fermentation is an an example for ---------- degradation  
a) Aerobic  
b) Anaerobic  
c) a and b  
d) None of the above

5) ---------------- is a cellulolytic bacteria  
a) Pseudomonas  
b) Klebsiella  
c) Mycoplasma  
d) Zymomonas

6) Rhizobium exist as ---------- in the nodules  
a) Protoplast  
b) Bacterioides  
c) Mycoplasma  
d) None of the above

7) Azospirillum is an example for  
a) Free living  
b) Symbiotic  
c) associative  
d) all the above

8) According to the American standard of potability ---------- number of E.coli can present in 100 ml of water  
a) 1  
b) 0  
c) 10  
d) 100

9) Application of alum is in ---------- phase of water treatment

10) Super Bug was developed and patented by ----------  
a) Khorana  
b) Kohnberg  
c) Chakraborthy  
d) Sanger

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)  
b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)  
b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)  
b) Explain carbon cycle

14a) Discuss MPN technique (or)  
b) Explain Eutrophication

15a) Describe Air pollution (or)  
b) Explain the methodology involved in Microbiological Air quality

SECTION – C (5X12=60 Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)  
b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)  
b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)  
b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)  
b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)  
b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?  (a) Bejerinck    (b) D. Ivanowski   (c) W. Stanley (d) M. Theiler
2. The spikes are otherwise  (a) Peplomers (b) Capsid (c) Envelope (d) Coat
3. The one step growth experiment was developed by  
   (a) Bejerinck     (b) D. Ivanowski   (c) W. Stanley   (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is  (a) T4 phage (b) MS2  (c) QB   (d) O X 174
5. The process of release of the prophage from the bacterial DNA is called 
   (a) Conduction  (b) Transfection  (c) Insertion (d) Induction
6. The int gene codes for the synthesis of an ----------enzyme 
   (a) Integrase  (b) Ligase  (c) Excisionase  (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called 
   (a) Non – infectious ss RNA   (b) Infectious ss RNA   (c) Non – infectious ss DNA  (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through 
   (a) Endodesmata (b) Pore (c) Echodesmata (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on 
   (a) Plasma membrane (b) Cytoplasm (c) Nucleus (d) None of the above
10. For measles, the immunogen is  
    (a) Active but attenuated   (b) Inactive but attenuated (c) Inactive heat killed  (d) Inactivated

SECTION – B (5X6=30Marks) - Answer ALL Questions.
11. (a) Give an account on cultivation of viruses in egg yolk region.  Or 
    (b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment.  Or 
    (b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage.  Or 
    (b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell.  Or 
    (b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS.  Or 
    (b) Give a brief outline on Rubella virus.

SECTION – C (5X12=60Marks) - Answer ALL Questions.
16. (a) Give a detailed account on viral purification and assay methods.  Or 
    (b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage.  Or 
    (b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny.  Or 
    (b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses.  Or 
    (b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus.  Or 
    (b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs                                      Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)

1. An example of zoonotic disease
   a. Malaria   b. filariasis   c. plaque   d. all the above
2. Persons with symptomless infection is called
   a. immersed   b. carrier   c. vector   d. resistant
3. The commonest cause of localized supplicative lesion in man is
   a. streptococci   b. staphylococci   c. Pseudomonas   d. Vibrio
4. Toxigenecity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus   b. Corynebacterium   c. Clostridium   d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. tetanus   b. lock jaw   c. epidemic   d. rabies
7. Food borne intoxication is caused by a. Salmonella   b. E.coli   c. Shigella   d. Staphylococcus
8. Darting motility is seen with a. E. coli   b. Streptococcus   c. V.cholerae   d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar   b. BSA   d. LJ   d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces   b. urine   c. sputum   d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11a. Define and differentiate carriers. (or)
    b. State Koch postulates.
12a. Give the features of Streptococcus. (or)
    b. Give the features of B.anthracs
13a. Describe the methods for diagnosis to tetanus (or)
    b. Describe the methods for diagnosis of gas gangrene.
14a. Write a short note on enteric fever. (or)
    b. Write a short note on bacillary dysentery.
15a. Give the features of Chlamidia. (or)
    b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16a. Elucidate the methods of transmission of infection with examples. (or)
    b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
    b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
    b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY–II

Duration – 3hrs  Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha  b) Mycelium  c) Mould  d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci  b) P. notatum  c) Rhizopus  d) Mucor

3. Candidosis is caused mainly by ________________
   a) C. albicans  b) C. tropicalis  c) C. pseudotropicalis  d) C. krusei

4. The major organism which causes urinary tract infection is ________________
   a) E. coli  b) Salmonella  c) Shigella  d) Klebsiella

5. Traveller's diarrhea is caused by ________________
   a) Enteropathogenic E. coli  b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli  d) Enterotoxigenic E. coli

6. Blue pus is caused by __________ a) Pseudomonas b) Vibrio c) Salmonella d) E. Coli

7. Sexually transmitted disease is caused by ______________
   a) Treponema b) Klebsiella c) Proteus d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as ______________
   a) Septicemia  b) bacteremia  c) Viremia  d) Algemia

9. MIC denotes ________________
   a) Maximum inhibitory concentration  b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration  d) None of the above

10. Endoflagella is a characteristic nature present in ________________
    a) Spirochetes b) Salmonella c) Proteus d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium  (or) b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or) b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17. a) Describe Trichus trichura  (or)
    b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis  (or) b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs                                                    Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuarts medium  b) Glycerol saline medium  c) Cary Blair medium  d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne  b) Ingestion  c) Direct inoculation  d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True  b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid  b) Blood  c) Semen  d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol  b) Sputolysin  c) Sputasol  d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol  b) Sodium hypochlorite  c) 2% Glutaraldehyde  d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium  b) Cooked meat medium  c) Saponin broth  d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA  b) ELISA  c) Western blot  d) PCR

10. For detection of *Mycobacterium tuberculosis*, the most sensitive and rapid method is
    a) Culturing on LJ medium  b) Acid fast staining  c) Animal susceptibility  d) Fluorescent Microscopy.

SECTION B (5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions.(OR)
b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory.(OR)
b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens?(OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine  c) Urine form catheter bag  d) Early morning urine sample

2. All the following are acid fast except,
   a) *Mycobacterium*  b) *Actinomycetes*  c) *Nocardia*  d) *Staphylococci*

3. The common medium used for growing *M tuberculosis* is
   a) Blood agar  b) Mac conkey agar  c) Lowenstein Jensen’s medium  d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics IMViC++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Klebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*

5. Selective medium for *Staphylococci* is a) EMB agar  b) BSA  c) MSA  d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b)24mm  c)28mm  d) 30mm

7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies  d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None

10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe? Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Growth medium for fungus inhibits growth of
   a) Bacteria  b) Protozoa  c) Virus d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus  b) Candida  c) Saccharomyces  d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon  b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic  d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium  b) Taenia saginata  c) Taenia corpus  d) Taenia pedis
5. Of the following organisms, which has a bigger size?
6. Hookworm infection is by
   a) Ingestion of embryonated eggs. b) Larvae penetrating through the skin
   b) c) Ingestion of larvae  d) the bite of insects
7. Viruses can be cultivated in
   a) Nutrient agar  b) Cell culture  c) Corn meal agar  d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA  b) IHA  c) Immunoelectrophoresis  d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg  b) HBsAg + HBcAg  c) HBsAg + Core antibody  d) HBcAg
10. Viruses are
    a) Found primarily in soil  b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar  d) Can be seen in bright field microscope.

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics? (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)  
   b) Name the specimen collected for dermatophytoses. Is it necessary to store such specimens?  
      How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)  
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium*. (OR)  
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)  
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)  
   b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

**Group A**: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester.

**Group B**: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C**: application oriented subjects: 2 subjects – 4 papers
The application–oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D**: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) Co-Curricular activities: NSS/NCC/Physical education
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows:

- A-Exemplary
- B-very good
- C-good
- D-fair
- E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**
   
a) A candidate will be permitted to appear for the university examinations for any semester if
   
i) He/she secures not less than 75% of attendance in the number of working days during the semester.
   
ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and
   
iii) His/her conduct has been satisfactory.
   
Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%.

d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**
   
a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**
   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**
   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**
   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**
   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**
    a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

    b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

        (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

        (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
i. has undergone the prescribed course of study for a period of not less than six semesters in an
   institution approved by/affiliated to the University or has been exempted from in the manner
   prescribed and has passed the examinations as have been prescribed therefor.
ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a
   certificate issued by the Principal of the institution.
iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the
   first attempt, within the minimum period prescribed for the course of study from the date of
   admission to the course and secures I or II class shall be eligible for ranking and such ranking
   will be confined to 10 % of the total number of candidates qualified in that particular branch of
   study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical
   shall be permitted to do so and such candidate shall join a college in the III year of the course
   and he/she will be permitted to appear for par III alone by granting exemption form appearing
   Part I, Part II and common allied subjects (if any), already passed by the candidate. And a
   candidate desirous to obtain an additional UG degree involving practical shall be permitted to
   do so and such candidate shall join a college in the II year of the course and he/she be permitted
   to appear for Part III alone by granting exemption form appearing for Part I, Part II and the
   common allied subjects. If any, already passed. Such candidates should obtain exemption from
   the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective
   courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each
   paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change
   for a minimum period of three years from the date of approval of the Regulations. The
   University may revise /amend/ change the Regulations and Scheme of Examinations, if found
   necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will
   be permitted to take the Examinations under those Regulations for a period of four years i.e. up
   to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the
   Examination only under the Regulations in force at that time.
## Scheme of Examinations

<table>
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<tr>
<th>Sem</th>
<th>Part</th>
<th>Subject and Paper</th>
<th>Instruction Hrs per week</th>
<th>University Examinations</th>
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<td>Core Paper VII - Principles of Immunology</td>
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<td>Core Paper X - Environmental and Agricultural Microbiology</td>
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*NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_),Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour,Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III : CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER – III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxyogenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family ) - Bioluminescence.

References
2. Tortora, Funke and case. Microbiology , 8th edition
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High sped, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT -III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al/Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA – replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S., 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT - III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT- IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References

SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lambda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method , Chemical- Calcium chloride and DEAE Methods , Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods , -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application,-Microarray.

References
SEMESTER – V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II

Vaccines – subunit vaccines-Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER - VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT - I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT - II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT - III


UNIT - IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT - V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose, Hemi cellulose, lignin, pectin and chitin. – Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes- coir pith composition- composting, principles and Applications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References

SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A.B). Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References

UNIT- I
Infections- sources of infections- types of infections- methods of infections- definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious diseases, infectious diseases cycle- investigation of epidemics- control of epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms *Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis, Corynebacterium diptheriae*.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive Organisms- *Clostridium perfringens, Clostridium tetani*.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative organisms *Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Vibrio cholerae*.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- *Mycobacterium Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira, Chlamydia, Rickettsiae*.

References

5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange Medical Publications, USA
SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II

MEDICAL MICROBIOLOGY - II

UNIT - I

UNIT - II

UNIT - III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT - IV
Pyogenic infections- *Staphylococcus* and *Pseudomonas*: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT - V

References


SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus and Streptococcus pyogenes.*
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia.*
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT –IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectorophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References

SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology –Collection and transport of clinical specimens –Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used –Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3-Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination -Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- *Entamoeba, Plasmodium, Ascaris, Taenia*
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs                                      Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert koch  b) Louis Pasteur  c) Antony Von Leewenhock  d) Both b & c
2) Immunity mediated by antibodies are called as ______________
   a) Humoral  b) Cell mediated  c) Active  c) Passive
3) _______ is the ability of a lens to separate or distinguish between small objects that are close together.
4) ____________ is used as a counter stain in sparse staining
   a) Safranin  b) Methylene blue  c) Malachite green  d) Crystal violet
5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP  b) TDT  c) D  d) None of the above.
6) HEPA filters can remove particles of size ______________
   a) 0.2 um  b) 0.3 um  c) 0.4 um  d) 0.5 um
7) McIntosh fildes jar method is used for cultivating ______________
   a) Aerobic organisms  b) Anaerobic organisms  c) Facultative anaerobic organisms  d) Microphilic organisms
8) ______________ is an example for selective media.
   a) Mac conkey agar  b) EMB agar  c) Both a & b  d) None of the above.
9) TVC refers to ____________
   a) Total viable count  b) Total viral count  c) Total viable colony  c) None of the above.
10) _______________ is an example for short term preservation of microbes.
    a) Agar slant  b) Agar slant  c) Mineral oil overlay  d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discus the contributions of Lister, Pasteur and koch to the germ theroy of disease and to the treatment or prevention of diseases.  (or)
       b) Describe koch's postulates in detail.
12) a) Describe fluorescence microscope  (or)
       b) Describe capsule staining.
13) a) Write the principle and application of autoclave.  (or)
       b) Comment on phenol coefficient test.
14) a) Comment on pure culture techniques.  (or)
       b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.
15) a) Discuss about the CO₂ liberation for the estimation of microbes.  (or)
       b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)  
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)  
    b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)  
    b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or)  
    b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)  
    b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY

Duration – 3hrs 
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain  (b) Genus  (c) Species  (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram  (b) Similarity matrix  (c) Dendrogram  (d) None of the above
3. Which of the following is a motile bacterium
   (a) Escherichia coli  (b) Klebsiella  (c) Bacillus subtilis  (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall  (b) Colonies have fried egg appearance  (c) Require sterols for growth  
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast  (b) Plastid  (c) Thylakoid  (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens  (b) Halophiles  (c) Thermophiles  (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores  (b) Zygosporoes  (c) Basidiospores  (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores  (b) Zygosporoes  (c) Conidiospores  (d) Chlamydosporoes
9. The members of phaeophyta are commonly known as
   (a) Red algae  (b) Green algae  (c) Blue green algae  (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall  (b) Move by flagella/pseudopodia  
    (c) Unicellular  (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaebacteria. Or
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples
14. (a) Explain the life cycle of Mucor Or
   (b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
   (b) Give a detailed account of Bergeys manual and its importance.
18. (a) Summarise the major characteristics of archaebacteria. Or
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi. Or
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide+ compounds (d) other compounds
2. Polarily flagellated bacteria is known as ------------
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occurs in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaeabacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B-1-4 linkage (d) Ionic linkage

   **SECTION–B(5X6=30Marks) - Answer ALL Questions.**
11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaeabacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

   **SECTION–C(5X12=60Marks)
   Answer ALL Questions.**
16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs                                                                         Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water                         (b) Pigments      (c) Light       (d) H2S
2. *Thiobacillus thiooxidans* is an example of----------
   (a) Chemoautotrophs              (b) Heterotrophs   (c) Photoautotrophs (d) Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant                (b) Barotolerant   (c) Psychrophilic (d) Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture         (b) Batch culture (c) Continuous culture (d) Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid                 (b) Fumaric acid  (c) Lactic acid   (d) Ketoglutaric acid
6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP                         (b) ED             (c) HMP          (d) TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound           (b) Oxygen         (c) Nitrogenous compound (d) Carbon dioxide
8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*  (b) *Chlorella sp* (c) *Klebsiella sp* (d) *Escherichia coli*
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water                      (b) Sunlight       (c) H2S          (d) O2
10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid                      (b) Carbohydrate  (c) Protein     (d) None of the above

SECTION – B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.
13. (a) Giving suitable example, describe substrate level phosphorylation. Or
    (b) Describe ED pathway.
14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a) What is anoxygenic photosynthesis? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION – C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria. Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs                      Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization   b. moist air sterilization  c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization  b. incineration  c. autoclave  d. oven.
3. Lyophilization is the
   a. separation of proteins     b. sudden freezing and dehydration
   c. enzyme reaction by oxidation             d. high pressure–segmentation.
4. The pH is defined as
   a. logH⁺   b. log2H⁺   c. -logH⁺   d. -log2H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution   b. lead sulphate  c. anions  d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid   b. lipid   c. protein  d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solution   b. nucleic acid  c. proteins  d. enzymes.
8. NPK analysis is done using
   a. electrophoresis  b. centrifugation.  c. flame photo  d. chromatography.
9. The pH of the blood is
   a. 6.3   b. 7.4   c. 7.0   d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
   b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or) 
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate 
i. the concentration of ammonium sulphate in a saturated solution at 0°C.
ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”

(or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16.a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------ to prove that the RNA also act as genetic material
   a) TMV             b) Retrovirus  c) Pox             d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A               b) B             c) C               d) Z

3) --------------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase          b) helicase     c)polymerase       d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg c) Meselson &stahl  d) Hershey & Chase

5) ---------- no of codons constitute the coding dictionary
   a) 64              b) 61            c) 62              d) 60
6) CAP is involved in---------?
   a) Catabolic repression    b) Induction c) feed back inhibition       d) None of these
7) ---------is an example for intercalating agent?
   a) Acridine orange   b) EMS    c) Nitrous oxide       d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair d) all of the above
9) Davis-u-tube expt is used to prove the existance of---------?
   a) Transformation  b) conjugation   c) transduction d0 recombination
10) Transformation was proved and demonstrated by------
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B (5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA          OR
        b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment          OR
        b) Describe DNA polymerase
13) a) Explain the features of genetic code          OR
        b) Discuss attenuator control in trp operon
14) a) Discuss Ame’s test          OR
        b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction          OR
        b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material          OR
        b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?          OR
        c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli          OR
        b) Describe the mechanism involved in the transformation of information from DNA to RNA
19) a) Explain how the organism protects its DNA from damage?          OR
        b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene
        OR
        b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as _______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) ________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) ________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitivity is otherwise called as ________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to _______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as ________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as ____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as __________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as __________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejectoin.

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti (b) pyruvic acid (c) fumaric acid (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia (b) Flavobacterium (c) Micrococcus (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min (b) 62.5°C, 30 min (c) 71.7°C, 15 sec (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus (b) Bacillus (c) Saccharomyces (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer (b) sauerkraut (c) soft drinks (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather (b) springer (c) flipper (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce (b) yoghurt (c) bread (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides (b) Streptococcus faecalis (c) Pediococcus cerevisiae (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample (b) storage of sample at room temperature for 24 hr (c) gathering information (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin (b) a neurotoxin (c) a hepatotoxin (d) a nephrotoxin.

SECTION B (5X6=30Marks) - Answer ALL Questions.
11a) What is the significance of molds in food microbiology? Describe. (or)
b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.

16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.
19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks

RECOMBINANT DNA TECHNOLOGY - I

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. GAATTC is the recognition sequence of
   (a) BamHI  (b) EcoRI  (c) HindIII  (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase  (b) E.coli ligase  (c) Sal ligase  (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA  (b) Protein  (c) Phosphatase  (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosomal  (b) Double stranded  (c) Self replicating  (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  (c)M13 Phage  (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi.
7. Colony hybridization technique is employed for
   (a)Selection of vector  (b)Unhybridised ones  (c)Selection of desirable clones  (d)None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation  (b) Microinjection  (c) Transformation  (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus  (b) Thermus aquaticus
   (c) Thermobacter aquaticus  (d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot  (b) Northern blot  (c) Western blot  (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. (a) Define cloning. Explain the various steps involved in cloning.  
(b) Explain the action of Methylases.

12. (a) Write a note on YAC.  
(b) Explain a typical cosmid vector.

13. (a) Give an account on cDNA synthesis.  
(b) How will you purify plasmid DNA?

14. (a) How alpha complementation of lac Z helps one to identify clone?  
(b) How will you identify a recombinant DNA by immunological assay?

15. (a) Explain Northern blotting technique.  
(b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16. (a) Define restriction enzyme and add a note on classification and its uses.  
(b) Give a brief account on ligases.

17. (a) Explain the construction of cDNA and DNA library.  
(b) Explain the chemical synthesis of DNA in laboratory.

18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example.  
(b) Give a brief account on lambda phage derived cloning vectors.

19. (a) Give a detailed account on gene transfer techniques.  
(b) How will you identify the presence of r DNA in a cell?.

20. (a) Explain Southern blotting technique and its applications.  
(b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II  
RECOMBINANT DNA TECHNOLOGY - II

Duration – 3hrs  
aximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) --------- are broad spectrum antiviral products  
   a) Histones  b)IFN  c) Streptomycin  d)Nystatin

2) Xanthan gum is produced from  
   a) Pseudomonas putida  b) Xanthomonas campestris  c)Xanthococcus  d) Zymomonas

3) --------- is involved in the fusion of myloma cells with spleen cells  
   a) PEG  b)PGA  c) IPTG  d) EtBr

4) Vaccines that require a carrier molecule for its activity is called as ---------  
   a) Subunit  b) Whole cell  c) Antidiotype  d) Peptide

5) --------- required for the transfer of the T DNA from A. tumifacience to plant cells  
   a) vir genes  b) Right border  c) Left border  d) IAA

6) Nopaline is ---------  
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme

7) Example of an animal model involved in transgenesis  
   a) Monkey  b) Snake  c)Dinosaurs  d) Mice
8) ------------ method is involved development of transgenic animal
   a) Microinjection   b) Protoplast fusion   c) Hybridoma technology   d) b and c
9) ------------ marker are involved in DNA Fingerprinting
   a) VNTR   b) RFLP   c) RAPD   d) STR3
10) Father of HGP
    a) Francis Collins   b) Venter   c) James Watson   d) Hunkapiller

SECTION–B(5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
    d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application ad development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION–C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19 a) Discuss methodologies involved in the creation of transgenic mice also add
     brief note on its application (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs                                      Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening   b. strain improvement   c. pilot scale   d. commercial operation
2. Glutamic acid is used for
   a. feed supplement   b. flavour enhancer   c. ethanol production   d. antibiotic fermentation
3. Steady state is achieved in ____________ fermentation.
   a. batch   b. fed-batch   c. continuous   d. all
4. Batch culture is a________________
   a. open culture system    b. system that maintains constant cell conc.
   c. system with addition of nutrients  d. closed culture system
5. Streptomycin fermentation by *S. griseus* produces
   a. Vitamin B2 as a by product  b. Vitamin B12 as a by product
   c. Vitamin C as a by product  d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag      b. log  c. stationary  d. decline
7. The term single –cell protein was coined at--------- in 1966
   a. CFTRI, Mysore  b. Massachusetts Institute of technology
   c. MTCC  d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol  b. methane  c. oil  d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery  b. quality control  c. sterilization  d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid  b. amino acid  c. both  d. none

**SECTION–B(5X6=30Marks) - Answer ALL Questions.**
11.a. Discuss the significance of microbes in the production of commercially important products.
    (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture     (or)
    .b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production. (or)
    .b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making  (or)
    .b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.  (or)
    .b. Write short notes on batch filters that are employed in down streaming processing.

**SECTION–C(5X12=60Marks) - Answer ALL Questions.**
16.a. Give a detailed account on the various methods of strain improvement     (or)
    b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor. (or)
    b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.  (or)
    b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.  (or)
    b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.  (or)
    b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is a) Ammensalism b) Commensalism c) Parasitism d) Synergism
2) Mycorhizal association is an example of a) Ammensalism b) Commensalism c) Parasitism d) Symbiosis
3) ___________ is an example of recalcitrant compound a) Lignin b) Protein c) Carbohydrate d) Lipid
4) Fermentation is an an example for ___________ degradation a) Aerobic b) Anaerobic c) a and b d) None of the above
5) ___________ is a cellulolytic bacteria a) Pseudomonas b) Klebsiella c) Mycoplasma d) Zymomonas
6) Rhizobium exist as ___________ in the nodules a) Protoplast b) Bacterioides c) Mycoplasma d) None of the above
7) Azospirillum is an example for a) Free living b) Symbiotic c) associative d) all the above
8) According to the American standard of potability ___________ number of E.coli can present in 100 ml of water a) 1 b) 0 c) 10 d) 100
9) Application of alum is in ___________ phase of water treatment
10) Super Bug was developed and patented by ___________ a) Khorana b) Kohnberg c) Chakraborthy d) Sanger

SECTION – B (5X6=30 Marks) - Answer ALL Questions.
11a) Discuss in brief in about Ammensalism (or) b) List the factors influencing density of microbes in soil
12a) Discuss the biology of composting (or) b) Comment on microbial decomposition of lignin
13a) Write short notes on biofertilizers (or) b) Explain carbon cycle
14a) Discuss MPN technique (or) b) Explain Eutrophication
15a) Describe Air pollution (or) b) Explain the methodology involved in Microbiological Air quality

SECTION – C (5X12=60 Marks) - Answer ALL Questions.
16a) Discuss different types of microbial association (or) b) Comment on microbial communities in the soil
17a) Explain aerobic and anaerobic degradation (or) b) Write an essay on dynamics of soil microbes
18a) Detail on symbiotic nitrogen fixation which involves root nodules (or) b) Explain phosphorus and sulphur cycle
19a) Write a detailed essay on water treatment (or) b) Explain the microbial composition and dynamics of aquatic ecology
20a) Write an essay on air sampling devices (or) b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
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CORE PAPER XI - VIROLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?  (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d)M. Theiler

2. The spikes are otherwise  (a)Peplomers  (b) Capsid  (c) Envelope  (d) Coat

3. The one step growth experiment was developed by
   (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d)Max Delbruck and Emory Ellis

4. Single stranded DNA phage is (a) T4 phage  (b) MS2  (c) QB  (d) O X 174

5. The process of release of the prophage from the bacterial DNA is called
   (a) Conduction  (b) Transfection  (c)Insertion  (d) Induction

6. The int gene codes for the synthesis of an  --------- enzyme
   (a) Integrase  (b) Ligase  (c) Excisionase  (d)Replicase

7. TMV has a Linked transport of two substances in the same direction is called
   (a) Non – infectious ss RNA  (b)Infectious ss RNA
   (c) Non – infectious ss DNA  (d) Infectious ss DNA

8. The int gene codes for the synthesis of an  --------- enzyme
   (a) Endodesmata  (b) Pore  (c) Echodesmata  (d) None of the above

9. In Herpes viridae the viral envelope adsorbs to the receptors on
   (a) Plasma membrane  (b) cytoplasm  (c) Nucleus  (d) None of the above

10. For measles , the immunogen is
    (a) Active but attenuated (b) Inactive but attenuated (c)Inactive heat killed  (d) Inactivated

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region.  Or
    (b) Write a note on viral envelopes and enzymes.

12. (a) Explain the one step growth experiment.  Or
    (b) Give an account on the structure of a typical bacterial virus.

13. (a) Give an account on reproduction of RNA phage.  Or
    (b) Describe lysogenic conversion and its significance.

14. (a) Write a note on penetration and uncoating of viruses in the animal cell.  Or
    (b) Write a note on characteristics of the viruses that infect algae and fungi.

15. (a) Write short notes on AIDS.  Or
    (b) Give a brief outline on Rubella virus.

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods.  Or
    (b) Give a brief account on the early development of virology.

17. (a) Explain briefly the reproduction of ds DNA T4 phage.  Or
    (b) Give a detailed account on ss DNA phage.

18. (a) Describe the temperate bacteriophages and lysogeny.  Or
    (b) Give a brief account on generation of defective phages and their uses.

19. (a) Explain briefly the reproduction of plant viruses.  Or
    (b) Give a detailed account on viruses and cancer.

20. (a) State the pathogenecity and laboratory diagnosis of Hepatitis B  virus.  Or
    (b) Explain the pathogenecity and laboratory diagnosis of Rabies  virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. An example of zoonotic disease a. Malaria      b. filariasis  c. plaque d. all the above
2. Persons with symptomless infection is called a. immune b. carrier c. vector d. resistant
3. The commonest cause of localized suppurative lesion in man is a. streptococci b. staphylococci c. Pseudomonas d. Vibrio
5. Spot the Gram positive anaerobic endospore forming bacillus a. Lactobacillus b. Corynebacterium c. Clostridium d. Mycobacterium
6. Clostridium tetani is the causative agent of a. anthrax disease b. lock jaw c. hepatitis d. rabies
7. Food borne intoxication is caused by a. Salmonella b. E.coli c. Shigell d. Staphylococcus
8. Darting motility is seen with a. E.coli b. Streptococcus c. V.cholerae d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae a. SS agar b. BSA c. LJ d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is a. faeces b. urine c. sputum d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.
11.a. Define and differentiate carriers. (or) b. State Koch postulates.
12.a. Give the features of Streptococcus. (or) b. Give the features of B.anthracs
13.a. Describe the methods for diagnosis to tetanus (or) b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or) b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidiae. (or) b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16.a. Elucidate the methods of transmission of infection with examples. (or) b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or) b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or) b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or) b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or) b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha         b) Mycelium         c) Mould         d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci   b) P. notatum    c) Rhizopus     d) Mucor

3. Candidosis is caused mainly by __________
   a) C. albicans b) C. tropicalis c) C. pseudotropicalis d) C. krusei

4. The major organism which causes urinary tract infection is ____________
   a) E. coli       b) Salmonella   c) Shigella   d) Klebsiella

5. Traveller's diarrhea is caused by ____________
   a) Enteropathogenic E. coli b) Enterotoxigenic E. coli c) Enteroinvasive E. coli d) Enterotoxigenic E. coli

6. Blue pus is caused by _______ a) Pseudomonas b) Vibrio        c) Salmonella d) E. Coli

7. Sexually transmitted disease is caused by ____________
   a) Treponema b) Klebsiella c) Proteus         d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as __________
   a) Septicemia b) bacteremia c) Viremia         d) Algemia

9. MIC denotes ____________
   a) Maximum inhibitory concentration b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration d) None of the above

10. Endoflagella is a characteristic nature present in __________
    a) Spirochetes b) Salmonella c) Proteus   d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium       (or) b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or) b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance  (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections  (or)
    b) Aspergillosis Describe.

17. a) Describe Trichusis trichura        (or)
    b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis (or) b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs                                                        Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.
2. All the following are transport media except,
   a) Stuarts medium   b) Glycerol saline medium c) Cary Blair medium d) Thioglycollate broth
3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne   b) Ingestion   c) Direct inoculation   d) Mucous membrane contact.
4. Needles should not be recapped, bent or broken after use.
   a) True   b) False
5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid b) Blood c) Semen d) CSF
6. Sputum can be liquefied with the following except,
   a) Dithiothreitol b) Sputolysin c) Sputasol d) Lysozyme
7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol b) Sodium hypochlorite c) 2% Glutaraldehyde d) Chloroform
8. Following media are used for blood culture except,
   a) Brain heart infusion medium b) Cooked meat medium c) Saponin broth d) Selenite F broth
9. A rapid method for the screening of HIV is
   a) Dot – ELISA b) ELISA c) Western blot d) PCR
10. For detection of *Mycobacterium tuberculosis*, the most sensitive and rapid method is
    a) Culturing on LJ medium b) Acid fast staining c) Animal susceptibility d) Fluorescent Microscopy.

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?
12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.
13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.
14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.
15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions.(OR)
b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory.(OR)
b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens?(OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs  
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine.  b) Mid stream urine  c) Urine form catheter bag  d) Early morning urine sample

2. All the following are acid fast except,
   a) *Mycobacterium*  b) *Actinomycetes*  c) *Nocardia*  d) *Staphylococci*

3. The common medium used for growing *M tuberculosis* is
   a) Blood agar  b) Mac conkey agar  c) Lowenstein Jensen’s medium  d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC+++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Kiebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*

5. Selective medium for *Staphylococci* is
   a) EMB agar  b) BSA  c) MSA  d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm

7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemaggulitation

8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies  d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None

10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.
11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.
12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.
13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.
14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.
15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.
17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.
18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.
19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.
20. a) What information is essential for the design of a pathogen specific nucleotide probe?
   Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs    Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria   b) Protozoa   c) Virus   d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus   b) Candida   c) Saccharomyces   d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon   b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic   d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium   b) Taenia saginata   c) Taenia corporis   d) Taenia pedis
5. Of the following organisms, which has a bigger size?
6. Hookworm infection is by
   a) Ingestion of embryonated eggs.   b) Larvae penetrating through the skin
   c) Ingestion of larvae   d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar   b) Cell culture   c) Corn meal agar   d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA   b) IHA   c) Immunoelectrophoresis   d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg   b) HBsAg + HBcAg   c) HBsAg + Core antibody   d) HBcAg
10. Viruses are
    a) Found primarily in soil   b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar   d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing
    another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was
    this action justified? Why?  (OR)
    b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about
    what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR) 
   b) Name the specimen collected for dermatophytoes. Is it necessary to store such specimens? 
      How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR) 
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — *Plasmodium*. (OR) 
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR) 
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR) 
   b) Immunofluorescence — a technique to detect viral infections — Explain.
1. **Eligibility for Admission to the Course**
   Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu in Biology / Botany / Zoology / Physics / Chemistry / Nursing / Biochemistry / Microbiology / Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

2. **Duration of the Course**
   The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

3. **Course of Study**
   The course of study for the UG degree courses of all branches shall consist of the following

   a) **Part - I**
      Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu.

      The subject shall be offered during the first four semesters with one examination at the end of each semester.

   b) **Part – II : English**
      The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester part II English will be offered as communication skills.

   c) **Foundation Course**
      The Foundation course shall comprise of two stages as follows:
      Foundation Course A : General Awareness (I & II semesters)
      Foundation Course B : Environmental Studies (III & IV semesters)

      The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.
      From the printed material supplied by the University - 75%
      Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

Group A: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

Group B: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

Group C: application oriented subjects: 2 subjects – 4 papers
The application –oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

Group D: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

Diploma Programme:
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

e) Co-Curricular activities: NSS/NCC/Physical education
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

a) A candidate will be permitted to appear for the university examinations for any semester if

i) He/she secures not less than 75% of attendance in the number of working days during the semester.

ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and

iii) His/her conduct has been satisfactory.

Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

d) A candidate who has secured less than 65%of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

b) “Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.
6. **Medium of Instruction and examinations**

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**

a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical ) in the University examination shall be declared to have passed the examination in the subject (theory or Practical ).

b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**

a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

(ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

(iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he/she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for part III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise/amend/change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
### SCHEME OF EXAMINATIONS

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*NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I  
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I 

UNIT – II 
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining-Albert.

UNIT – III 

UNIT – IV 
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, McIntost fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V 

References 
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GRA CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount – LCB - Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor- Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER –IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High speed, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT -III


UNIT –IV


UNIT-V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit, Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GR A CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al / Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA- replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S, 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate-Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

1. Kuby.J.1997 .,Immunology,W.H.Freeman,NY
SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts); factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV


UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction: Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application, - Microarray.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT –I
Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT –II
Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT –III
Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV

UNIT -V
DNA finger printing and its Application.
Human Genome Project and History and its Application , Bioremediation.

References
SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplastic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT- IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Inter cellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT-I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT-II
Microbial decomposition; cellulose, Hemi cellulose, lignin, pectin and chitin. – Factors influencing degradation- acetate utilization -bioconversion of organicwastes- sugarcane wastes-coir pith composition- composting, principles and Applications- conversion process

UNIT-III

UNIT-IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References


SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A.B). Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References


SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT-I
Infections- sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of
epidemics.

UNIT-II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis,
Corynebacterium diphtheriae.

UNIT-III
Morphology, pathogenicity and laboratory diagnosis- Gram positive
Organisms- Clostridium perfringens, Clostridium tetani.

UNIT-IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative
organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella,
Pseudomonas, Vibrio cholerae.

UNIT-V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium
Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospora,
Chlamydias, Rickettsiae.

References
1. Mackie and Mc catney, 1994, Medical Microbiology No I and II. Churchill
   Livingston, 14th edition.
   Longman.
   Calcutta.
   Mosby Publications.
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange
   Medical Publications, USA
SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT- I

UNIT -II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancroftii, Enterobius, Trichuris trichura.

UNIT -III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT -IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT -V

References
SEMESTER VI
GR A CORE PRACTICAL III

1. Isolation of Nucleic acids
2. Isolation of drug resistant mutants using UV and Chemical agents
3. Induction of Lac Operon – ONPG method
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus and Streptococcus pyogenes*.
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*
7. Methylene blue reduction test
8. Microbial analysis of spoiled food – Bread and Vegetables
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*
10. Direct microscopic examination of curd – observation of lactobacilli
11. Enzyme production and assay – protease and amylase
12. Alcohol production / wine
13. Immobilization- Demonstration
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia.*
16. Isolation and titration of coliphages
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT –IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches– rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectorophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References

SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology – Collection and transport of clinical specimens – Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology – detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunoelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- *Entamoeba, Plasmodium, Ascaris, Taenia*
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs
Maximum– 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert koch  b) Louis Pasteur  c) Antony Von Leewenhock  d) Both b & c

2) Immunity mediated by antibodies are called as _________________
   a) Humoral  b) Cell mediated  c) Active  d) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) _____________ is used as a counter stain in spare staining
   a) Safranin  b) Methylene blue  c) Malachite green  d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP  b) TDT  c) D  d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um  b) 0.3 um  c) 0.4 um  d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms  b) Anaerobic organisms  c) Facultative anaerobic organisms  d) Microphilic organisms

8) _____________ is an example for selective media.
   a) Mac conkey agar  b) EMB agar  c) Both a & b  d) None of the above.

9) TVC refers to ____________
   a) Total viable count  b) Total viral count  c) Total viable colony  d) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant  b) Agar slant  c) Mineral oil overlay  d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO₂ liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - AnswerALLQuestions.

16) a) Describe spontaneous generation theory. (or) 
b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or) 
b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or) 
b) Describe filtration and its types.
19) a) Discuss the types of media with eg. for each. (or) 
b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or) 
b) Describe the types of long term preservation of cultures.

CORE PAPER II -MICROBIAL DIVERSITY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain    (b) Genus    (c) Species    (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram    (b) Similarity matrix    (c) Dendrogram    (d) None of the above
3. Which of the following is a motile bacterium
   (a) Esherichia coli    (b) Klebsiella    (c) Bacillus subtilis    (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall    (b) Colonies have fried egg appearance    (c) Require sterols for growth
   (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast    (b) Plastid    (c) Thylakoid    (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens    (b) Halophiles    (c) Thermophiles    (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores    (b) Zygospores    (c) Basidiospores    (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores    (b) Zygospores    (c) Conidiospores    (d) Chlamydospores
9. The members of phaeophyta are commonly known as
   (a) Red algae    (b) Green algae    (c) Blue green algae    (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall    (b) Move by flagella/pseudopodia
    (c) Unicellular    (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or 
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or 
   (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaeabacteria. Or 
   (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples
14. (a) Explain the life cycle of Mucor Or 
   (b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or 
   (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or 
   (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or 
   (b) Give a detailed account of Bergey's Manual and its importance.
18. (a) Summarise the major characteristics of archaeabacteria. Or 
   (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi. Or 
   (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Cholorophyta and phaeophyta. Or 
   (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III - CELL BIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan (b) Lipopolysaccharide
   (c) Peptidoglycan + Lipopolysaccharide + compounds (d) other compounds
2. Polarly flagellated bacteria is known as ---------------
   (a) Lophotrichous (b) Peritrichous
   (c) Atrichous (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane  (b) Mitochondria
   (c) Polyphosphate granules  (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes  (b) A double membrane structure
   (c) Communication with cytoplasm  (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid  (b) Phage lambda  (c) M13 Plage  (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage  (b) Plasmid  (c) Plasmid and phage  (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport  (b) Facilitated diffusion  (c) Symport  (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells  (b) Prokaryotic cells  (c) Both a & b  (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles  (b) Extreme thermophiles  (c) Acidophiles  (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage  (b) Ether linkage  (c) B 1-4 linkage  (d) Ionic linkage

SECTION – B (5X6=30Marks) - Answer ALL Questions.
11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION – C (5X12=60Marks)
Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------ as source of energy
   (a) Water           (b) Pigments        (c) Light           (d) H2S
2. *Thiobacillus thiooxidans* is an example of---------
   (a) Chemoautotrophs  (b) Heterotrophs  (c) Photoautotrophs  (d) Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant    (b) Barotolerant   (c) Psychrophilic    (d) Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture  (b) Batch culture (c) Continous culture  (d) Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid      (b) Fumaric acid    (c) Lactic acid    (d) Ketoglutaric acid
6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP              (b) ED               (c) HMP              (d) TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulfur compound  (b) Oxygen           (c) Nitrogenous compound (d) Carbon dioxide
8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae*  (b) *Chlorella sp*  (c) *Klebsiella sp*  (d) *Escherichia coli*
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water           (b) Sunlight          (c) H2S             (d) O2
10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid           (b) Carbohydrate    (c) Protein         (d) None of the above

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria.  Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth.  Or
    (b) Give an account on Diauxic growth.
13. (a) Giving suitable example, describe substrate level phosphorylation.  Or
    (b) Describe ED pathway.
14. (a) Describe alcoholic fermentation.  Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a) What is anoxygenic photosynthesis? Describe.  Or
    (b) Give a brief note on Bioluminescence.

SECTION-C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria.  Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth.  Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION - PRINCIPLES AND APPLICATIONS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.

1. Hot air oven functions based on the principle of
   a. dry air sterilization b. moist air sterilization c. membrane filtr d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization b. incineration c. autoclave d. oven.
3. Lyophilization is the
   a. separation of proteins b. sudden freezing and dehydration c. enzyme reaction by oxidation d. high pressure–segmentation.
4. The pH is defined as
   a. logH⁺ b. log2H⁺ c. -logH⁺ d. -log2H⁺
5. Which is used as an absorbent in TLC.
   a. KCl solution b. lead sulphate c. anions d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid b. lipid c. protein d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solutio b. nucleic acid c. proteins d. enzymes.
8. NPK analysis is done using
   a. electrophoresi b. centrifugation. c. flame photo d. chromatography.
9. The pH of the blood is
   a. 6.3 b. 7.4 c. 7.0 d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
   b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml/g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV  b) Retrovirus  c) Pox  d) Bacteriophage
2) Which form of DNA is prevalent in living cells?
   a) A  b) B  c) C  d) Z
3) -------- Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase  b) helicase  c) polymerase  d) primase
4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad  b) Tautam &Lederberg  c) Meselson &stahl  d) Hershey & Chase
5) --------- no of codons constitute the coding dictionary
   a) 64  b) 61  c) 62  d) 60
6) CAP is involved in----------?
   a) Catabolic repression  b) Induction c) feed back inhibition   d) None of these

7) ----------is an example for intercalating agent?
   a) Acridine orange   b) EMS    c) Nitrous oxide    d) UV

8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair d) all of the above

9) Davis-u-tube expt is used to prove the existance of--------?
   a) Transformation  b) conjugation  c) transduction d0 recombination

10) Transformation was proved and demonstrated by-----
     a) Griffith  b) Sanger    c) Grick     d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11) a) Elucidate the structure of DNA        OR
    b) Discuss the characters of a genetic material

12) a) Prove that replication is semi conservative by a suitable experiment        OR
    b) Describe DNA polymerase

13) a) Explain the features of genetic code        OR
    b) Discuss attenuator control in trp operon

14) a) Discuss Ame’s test        OR
    b) Discuss photoreactivation

15) a) Discuss briefly specialized transduction        OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Explain the experiments that led to the establishment of DNA as genetic material    OR
    b) Explain the different forms of DNA

17) a) How the naked DNA is condensed and organized in a prokaryotic cell?        OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the enzyme involved

18) a) List and explain the negatively controlled operon in E.Coli  OR
    b) Describe the mechanism involved in the transformation of information from DNA to RNA

19) a) Explain how the organism protects its DNA from damage?        OR
    b) Explain the phenomenon involved in generation of mutants?

20) a) Describe the process involved in genetic exchange which depends on physical contact between cells and how it is exploited in mapping gene
     OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of naked DNA?
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner

2) Formation and development of red and white blood cells from stem cells is called as _______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.

3) _________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes

4) _________________ is the immunogloutin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG

5) Type I hypersensitiity is otherwise called as _________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.

6) LATS refer to _______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator  c) Lymph acting thyroid stimulator  d) None of the above.

7) The antibody causing agglutination is called as _________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin

8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.

9) Grafts between two genetically non identical members of the same species are called as ____________
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft

10) The method of transferring immunity by means of lymphoid cells is known as ____________
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION – B (5 x 6 = 30 Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus. (or)
    b) Describe phagocytosis process.

12) a) Comment on classical complement pathway. (or)
    b) Describe IgG antibody.

13) a) Explain type IV hypersensitivity reaction. (or)
    b) Comment on autoimmune disorders.

14) a) Give a brief note on RIA (or)
    b) Give a detailed account on hybridoma technology.

15) a) Comment on Rh blood group system. (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION – C (5 x 12 = 60 Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier (or)
    b) Define and describe MALT.

17) a) Describe the types of immunity. (or)
    b) Comment on abnormal immunoglobulins

18) a) Describe the primary and secondary mediators of anaphylaxis (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti    (b) pyruvic acid    (c) fumaric acid    (d) aminoacids

2. All the following genera of bacteria produce pigments except
   (a) Serratia    (b) Flavobacterium    (c) Micrococcus    (d) Klebsiella

3. The high temperature short time (HTST) method of pasteurization employs a temperature time combination of
   (a) 62.8°C, 30 min    (b) 62.5°C, 30 min    (c) 71.7°C, 15 sec    (d) 71.7°C, 15 min

4. Ropiness of bread is caused by species of
   (a) Aspergillus    (b) Bacillus    (c) Saccharomyces    (d) Serratia

5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer    (b) sauerkraut    (c) soft drinks    (d) fruit juice

6. A can with a minute leak during storage is called a
   (a) breather    (b) springer    (c) flipper    (d) sparger

7. The term leavening is associated with the preparation of
   (a) soy sauce    (b) yoghurt    (c) bread    (d) cheese

8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides    (b) Streptococcus faecalis    (c) Pediococcus cerevisiae    (d) Staphylococcus aureus

9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample    (b) storage of sample at room temperature for 24 hr    (c) gathering information    (d) laboratory testing

10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin    (b) a neurotoxin    (c) a hepatotoxin    (d) a nephrotoxin.

SECTION B (5X6=30Marks) - Answer ALL Questions.

11a) What is the significance of molds in food microbiology? Describe. (or)
    b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.

12a) Discuss the drying process as a method of food preservation. (or)
    b) Explain the role of radiation in food preservation.

13a) What are the various rots of eggs produced by bacteria? Describe. (or)
    b) Describe the colour changes in milk due to the growth of spoilage microorganisms.

14a) Describe briefly the production of soy sauce. (or)
    b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria.  
(b) Give a brief account of food standards.

SECTION – C (5X12=60Marks)  
Answer ALL Questions.

16a) Discuss the importance of bacteria in food microbiology with suitable examples  (or)  
(b) What are the various factors that influence the growth of microorganisms in foods.

17a) Discuss the use of high temperature in food preservation. (or)  
(b) Discuss the principles of food preservation.

18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)  
(b) Discuss the biological spoilage of canned foods.

19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)  
(b) With neat flow chart describe the production of cheese.

20a) Describe in detail about food borne infections caused by bacteria. (or)  
(b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I

Duration – 3hrs  
Maximum – 75 Marks

RECOMBINANT DNA TECHNOLOGY - I

SECTION A (10 x 1= 10 Marks)  
Choose the correct answer for each from the FOUR alternatives given

1. GAATTC is the recognition sequence of  
   (a) BamHI   (b) EcoRI   (c) HindIII   (d) HaeIII

2. An example of a ligase capable of both blunt and cohesive end ligation is  
   (a) T4 ligase   (b) E.coli ligase   (c) Sal ligase   (d) All

3. Phosphoramidite method is used for the synthesis of  
   (a) DNA   (b) Protein   (c) Phosphatase   (d) Phosphoric acid

4. Plasmids are DNA strands which are  
   (a) Extrachromosomal   (b) Double stranded   (c) Self replicating   (d) All the above

5. Insertional vectors are derived from  
   (a) Bacterial plasmid   (b) Phage lambda   (c)M13 Phage   (d) Yeast plasmid

6. Cosmid are novel vector that combines the features of  
   (a) Phage   (b) Plasmid   (c) Plasmid and phage   (d) Fungi.

7. Colony hybridization technique is employed for  
   (a)Selection of vector   (b)Unhybridised ones   (c)Selection of desirable clones   (d)None of the above

8. The introduction of DNA into a single eukaryotic cell with a fine needle  
   (a) Electroporation   (b) Microinjection   (c) Transformation   (d) None

9. Taq polymerase is isolated from  
   (a) Thermophilus aquaticus   (b) Thermus aquaticus   (c) Thermobacter aquaticus(d) Thermus aquaticae

10. Hybridization technique used to detect protein in a gel is  
    (a) Southern blot   (b) Northern blot   (c) Western blot   (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or
   (b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or
   (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or
   (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or
   (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or
   (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or
   (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
   (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
   (b) How will you identify the presence of r DNA in a cell?
20. (a) Explain Southern blotting technique and its applications. Or
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs  aximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) --------- are broad spectrum antiviral products
   a) Histones  b)IFN    c) Streptomycin   d)Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris c)Xanthococcus  d) Zymomonas
3) --------- is involved in the fusion of myloma cells with spleen cells
   a) PEG         b)PGA      c) IPTG       d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as ---------
   a) Subunit b) Whole cell c) Antiidiotype d) Peptide
5) --------- required for the transfer of the T DNA from A. tumifaciencе to plant cells
   a) vir genes b) Right border c) Left border d) IAA
6) Nopaline is ---------
   a) Unusual Amino acid b) Nucleotide c) Vitamin d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey b) Snake c)Dinosaurs d) Mice
8) ____________ method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) ____________ marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
   a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION – B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
   d) List the uses Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
   b) List the uses and application of monoclonal antibodies
13a) Explain in short the application and development of transgenic sheep (or)
   b) Transgenic mice; DNA microinjection method of development - explain
14a) Explain in short about Ti based cointegrate vectors (or)
   b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
   b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
   b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
   b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
   b) Elucidate methods involved in generation of insect, virus, resistant plants
19) a) Discuss methodologies involved in the creation of transgenic mice also add
   brief note on its application (or)
   b) Discuss about transgenic - goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
   b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in ______________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a________________
   a. open culture system   b. system that maintains constant cell conc.
   c. system with addition of nutrients   d. closed culture system
5. Streptomycin fermentation by S. griseus produces
   a. Vitamin B2 as a by product   b. Vitamin B12 as a by product
   c. Vitamin C as a by product   d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at -------- stage of their growth.
   a. lag   b. log   c. stationary   d. decline
7. The term single –cell protein was coined at------------- in 1966
   a. CFTRI, Mysore   b. Massachusetts Institute of technology
   c. MTCC   d. Imperial chemical Industries.
8. _______ was at one time the most important substrate for SCP production
   a. methanol   b. methane   c. oil   d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery   b. quality control   c. sterilization   d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid   b. amino acid   c. both   d. none

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. Discuss the significance of microbes in the production of commercially important products.
   (or)   b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture   (or)
   .b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.   (or)
   b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making   (or)
   b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.   (or)
   b. Write short notes on batch filters that are employed in down streaming processing.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Give a detailed account on the various methods of strain improvement   (or)
   b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.   (or)
   b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.   (or)
   b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.   (or)
   b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.   (or)
   b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) -------------- is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an an example for -------------- degradation
   a) Aerobic b) Anaerobic  c) a and b  d) None of the above

5) -------------- is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium exist as -------------- in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability -------------- number of E.coli can present in 100 ml of water
   a) 1  b)0  c)10  d) 100

9) Application of alum is in -------------- phase of water treatment

10) Super Bug was developed and patented by --------------
    a) Khorana  b) Kohnberg  c) Chakraborthy  d) Sanger

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV? (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) M. Theiler
2. The spikes are otherwise (a) Peplomers  (b) Capsid  (c) Envelope  (d) Coat
3. The one step growth experiment was developed by (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) Max Delbruck and Emory Ellis
4. Single stranded DNA phage is (a) T4 phage  (b) MS2  (c) QB  (d) OX 174
5. The process of release of the prophage from the bacterial DNA is called (a) Conduction  (b) Transfection  (c) Insertion  (d) Induction
6. The int gene codes for the synthesis of an ------------ enzyme (a) Integrase  (b) Ligase  (c) Excisionase  (d) Replicase
7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA  (b) Infectious ss RNA  (c) Non – infectious ss DNA  (d) Infectious ss DNA
8. Plant viruses penetrate the host cells through (a) Endodesmata  (b) Pore  (c) Echodesmata  (d) None of the above
9. In Herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane  (b) Cytoplasm  (c) Nucleus  (d) None of the above
10. For measles, the immunogen is (a) Active but attenuated  (b) Inactive but attenuated  (c) Inactive heat killed  (d) Inactivated

SECTION B (5X6=30Marks) - Answer ALL Questions.
11. (a) Give an account on cultivation of viruses in egg yolk region.  Or  
(b) Write a note on viral envelopes and enzymes.
12. (a) Explain the one step growth experiment.  Or  
(b) Give an account on the structure of a typical bacterial virus.
13. (a) Give an account on reproduction of RNA phage.  Or  
(b) Describe lysogenic conversion and its significance.
14. (a) Write a note on penetration and uncoating of viruses in the animal cell.  Or  
(b) Write a note on characteristics of the viruses that infect algae and fungi.
15. (a) Write short notes on AIDS.  Or  
(b) Give a brief outline on Rubella virus.

SECTION C (5X12=60Marks) - Answer ALL Questions.
16. (a) Give a detailed account on viral purification and assay methods.  Or  
(b) Give a brief account on the early development of virology.
17. (a) Explain briefly the reproduction of ds DNA T4 phage.  Or  
(b) Give a detailed account on ss DNA phage.
18. (a) Describe the temperate bacteriophages and lysogeny.  Or  
(b) Give a brief account on generation of defective phages and their uses.
19. (a) Explain briefly the reproduction of plant viruses.  Or  
(b) Give a detailed account on viruses and cancer.
20. (a) State the pathogenicity and laboratory diagnosis of Hepatitis B virus.  Or  
(b) Explain the pathogenicity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I
Duration – 3hrs
Maximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. An example of zoonotic disease a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called a. immune b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
5. Spot the Gram positive anaerobic endospore forming bacillus a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae a. SS agar  b. BSA  c. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is a. faeces  b. urine  c. sputum  d. blood

SECTION – B(5X5=25Marks) - Answer ALL Questions.
11.a. Define and differentiate carriers. (or)
   b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)
   b. Give the features of B.anthracis
13.a. Describe the methods for diagnosis to tetanus (or)
   b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)
   b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidiae. (or)
   b. Give the features of Rickettsiae.

SECTION – C(5X8=40Marks) - Answer ALL Questions.
16.a. Elucidate the methods of transmission of infection with examples. (or)
   b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
   b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
   b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
   b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
   b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha b) Mycelium c) Mould d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci b) P. notatum c) Rhizopus d) Mucor

3. Candidosis is caused mainly by _____________
   a) C. albicans b) C. tropicalis c) C. pseudotropicalis d) C. krusei

4. The major organism which causes urinary tract infection is ________________
   a) E. coli b) Salmonella c) Shigella d) Klebsiella

5. Traveller's diarrhea is caused by _________________
   a) Enteropathogenic E. coli b) Enterotoxigenic E. coli c) Enteroinvasive E. coli d) Enterotoxigenic E.coli

6. Blue pus is caused by ______   a) Pseudomonas b) Vibrio c) Salmonella d) E. Coli

7. Sexually transmitted disease is caused by ______________
   a) Treponema b) Klebsiella c) Proteus d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as____________
   a) Septicemia b) bacteremia c) Viremia d) Algemia

9. MIC denotes ________________
   a) Maximum inhibitory concentration b) Minimum inhibitory concentration c) Multiple inhibitory concentration d) None of the above

10. Endoflagella is a characteristic nature present in _____________
    a) Spriochetes b) Salmonella c) Proteus d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium (or) b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or) b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17. a) Describe Trichusis trichura (or)
    b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis (or) b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria (or)
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.
2. All the following are transport media except,
   a) Stuart's medium  b) Glycerol saline medium  c) Cary Blair medium  d) Thioglycollate broth
3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne  b) Ingestion  c) Direct inoculation  d) Mucous membrane contact.
4. Needles should not be recapped, bent or broken after use.
   a) True  b) False
5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid  b) Blood  c) Semen  d) CSF
6. Sputum can be liquefied with the following except,
   a) Dithiothreitol  b) Sputolysin  c) Sputasol  d) Lysozyme
7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol  b) Sodium hypochlorite  c) 2% Glutaraldehyde  d) Chloroform
8. Following media are used for blood culture except,
   a) Brain heart infusion medium  b) Cooked meat medium  c) Saponin broth  d) Selenite F broth
9. A rapid method for the screening of HIV is
   a) Dot – ELISA  b) ELISA  c) Western blot  d) PCR
10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium  b) Acid fast staining  c) Animal susceptibility  d) Fluorescent Microscopy.

SECTION B (5 x 6 = 30 Marks) - Answer ALL Questions.
11. a) As a healthcare worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?
12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections? (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.
13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.
14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.
15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method? (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions. (OR)
b) Describe the procedures used for culturing anaerobic microorganisms.

17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.

18. a) Comment on the biological safety cabinets in a Microbiology laboratory. (OR)
b) How can individual pathogenic viruses be identified in the lab.

19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.

20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens? (OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine c) Urine form catheter bag  d) Early morning urine sample

2. All the following are acid fast except,
   a) *Mycobacterium*  b) *Actinomycetes*  c) *Nocardia*  d) *Staphylococci*

3. The common medium used for growing *M tuberculosis* is
   a) Blood agar b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium

4. An isolate form as urine specimen shows the following biochemical characteristics IMViC+++-- respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Klebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*

5. Selective medium for *Staphylococci* is a) EMB agar b) BSA  c) MSA  d) XLD agar

6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm

7. VDRL is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination

8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion
   c) have circulating anti A and B antibodies  d) Have the same haplotype.

9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None

10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION–B (5X6=30Marks) - Answer ALL Questions.
11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”.
   (OR)
   b) Explain microscopic examination of urine specimen.
12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.
13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.
14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.
15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.
17. a) How can a clinical microbiologist determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.
18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.
19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.
20. a) What information is essential for the design of a pathogen specific nucleotide probe? Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria    b) Protozoa    c) Virus    d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus    b) Candida    c) Saccharomyces    d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon    b) Trophozoites and cyst are found in duodenum
   c) CFT is diagnostic    d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium    b) Taenia saginata    c) Taenia corporis    d) Taenia pedis
5. Of the following organisms, which has a bigger size?
   a,) Entamoeba histolytica    b) Entamoeba coil    c) Entamoeba hartmanni    d) Escherichia coil.
6. Hookworm infection is by
   a) Ingestion of embryonated eggs. b) Larvae penetrating through the skin
   b) c) Ingestion of larvae    d) the bite of insects
7. Viruses can be cultivated is
   a) Nutrient agar    b) Cell culture    c) Corn meal agar    d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA    b) IHA    c) Immunoelectrophoresis    d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg    b) HBsAg + HBcAg    c) HBsAg + Core antibody    d) HBcAg
10. Viruses are
   a) Found primarily in soil    b) Obligate intracellular parasites
   c) Can be cultivated in nutrient agar    d) Can be seen in bright field microscope.

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
   b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
    b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
    b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infection and recover most quickly. (OR)
    b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
    b) What are the three main routes of egg inoculation for virus isolation?
SECTION-C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing. (OR)
    b) Name the specimen collected for dermatophytoses. Is it necessary to store such specimens? How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male? (OR)
    b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — Plasmodium. (OR)
    b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis. (OR)
    b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
    b) Immunofluorescence — a technique to detect viral infections — Explain.
B. Sc. Microbiology (Colleges-revised) 2007-08

REGULATIONS FOR B.Sc., MICROBIOLOGY DEGREE COURSE and
COMPULSORY DIPLOMA IN DIAGNOSTIC MICROBIOLOGY
with Semester System
(with effect from 2007-2008)

1. Eligibility for Admission to the Course
Candidate for admission to the first year of the B.Sc., Microbiology degree course shall be
required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu
in Biology / Botany / Zoology/ Physics / Chemistry/ Nursing / Biochemistry / Microbiology /
Computer Science / Home Science / DMLT or Diploma in Pharmacy or Pharmacology as are of
the subjects or other examinations accepted as equivalent there to by the Syndicate, subject to
such other conditions as may be prescribed therefor.

2. Duration of the Course
The course shall extend over a period of three years comprising of six semesters with two
semesters in one academic year. There shall not be less than 90 working days for each semester.
Examination shall be conducted at the end of every semester for the respective subjects.

3. Course of Study
The course of study for the UG degree courses of all branches shall consist of the following

a) Part - I
Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam,
Hindi, Sanskrit, French, German, Arabic & Urdu.

The subject shall be offered during the first four semesters with one examination at the end of
each semester.

b) Part – II : English
The subject shall be offered during the first four semesters with one examination at the end of
each semester. During third semester part II English will be offered as communication skills.

c) Foundation Course
The Foundation course shall comprise of two stages as follows:
Foundation Course A : General Awareness (I & II semesters)
Foundation Course B : Environmental Studies (III & IV semesters)

The syllabus and scheme of examination for the foundation course A, General awareness shall
be apportioned as follows.
From the printed material supplied by the University - 75%
Current affairs & who is who? - 25%
The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

d) Part – III

Group A: Core subject – As prescribed in the scheme of examination.
Examination will be conducted in the core subjects at the end of every semester

Group B: allied subjects -2 subjects-4 papers
Examination shall be conducted in the allied subjects at the end of first four semesters.

Group C: application oriented subjects: 2 subjects – 4 papers
The application-oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

Group D: field work/institutional training
Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3rd year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

Diploma Programme:
All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V & VI semesters.

e) Co-Curricular activities: NSS/NCC/Physical education
Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student’s performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary
B-very good
C-good
D-fair
E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4th or 5th or 6th semester).
(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

4. **Requirement to appear for the examinations**

   a) A candidate will be permitted to appear for the university examinations for any semester if
      i) He/she secures not less than 75% of attendance in the number of working days during the semester.
      ii) He/she earns a progress certificate from the head of the institution, of having satisfactorily completed the course of study prescribed in the subjects as required by these regulations, and
      iii) His/her conduct has been satisfactory.

   Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

   b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.

   c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%

   d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

5. **Restrictions to appear for the examinations**

   a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.

   b) "Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years form the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree."
6. **Medium of Instruction and examinations**
   The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

7. **Submission of Record Note Books for practical examinations**
   Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

8. **Passing Minimum**
   a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical) in the University examination shall be declared to have passed the examination in the subject (theory or Practical).

   b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

9. **Improvement of Marks in the subjects already passed**
   Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

10. **Classification of Successful candidates**
    a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**

    b) (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**

        (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**

        (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**
11. **Conferment of the Degree**
   No candidate shall be eligible for conferment of the Degree unless he / she,
   i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
   ii. Has satisfactory participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
   iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

12. **Ranking**
   A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10 % of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.
   The improved marks will not be taken into consideration for ranking.

13. **Additional Degree**
   Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for par III alone by granting exemption form appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption form appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-. 

14. **Evening College**
   The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

15. **Syllabus**
   The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

16. **Revision of Regulations and Curriculum**
   The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise /amend/ change the Regulations and Scheme of Examinations, if found necessary.

17. **Transitory Provision**
   Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.
### SCHEME OF EXAMINATIONS

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* NOTE – Students has to submit a record of work done during their training period which will be evaluated through *viva voce* along with the core practical III examination.

- Students should undergo an institutional training for a continuous period of 15 days before semester VI
SEMESTER - I
CORE PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT – I

UNIT – II
Microscopy and Staining -Microscopy – Principles and application – Bright field, Dark field, Phase contrast, Fluorescence, SEM & TEMS- Specimen preparation of electron microscopy – freeze etching- Staining- Stains and Staining reactions – Types of staining – Simple, Differential (Gram’s, Spore, AFB_), Capsule staining, Nuclear and Flagella staining- Albert.

UNIT – III

UNIT – IV
Culture techniques -Media preparation -Solid and Liquid- Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique— Wright’s tube, Roll tube, Mcintosh fildes jar method -Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

UNIT – V

References
SEMESTER -II
CORE PAPER II : MICROBIAL DIVERSITY

UNIT – I

UNIT – II

UNIT – III
Taxonomy of Photosynthetic Eubacteria and Archaebacteria- General characteristics.

UNIT – IV
Taxonomy of Fungi (Alexopolous) -General Characteristics-Life Cycles of Mucor, Neurospora, Agaricus, Dictyostelium.

UNIT – V

References
SEMESTER -II

CORE PAPER III :CELL BIOLOGY

UNIT – I

UNIT – II

UNIT III
Cell division in Bacteria – Binary fission - Cell division of Eukaryotes – Mitosis and Meiosis.

UNIT IV

UNIT V
Archaebacterial cell wall and cell membranes of Methanogens - Halophiles - Thermoacidiphiles.

References
SEMESTER II
GR A CORE PRACTICAL 1

1. Laboratory precautions
2. Preparation of cleaning solutions
3. Antiseptics and disinfectants
4. Principles of aseptic techniques
5. Culture media preparation – Liquid and Solid medium
6. Selective and differential media
7. Methods of sterilization and testing of sterility
8. Enumeration of Bacteria, Fungi and Actinomycetes from soil
9. Pure culture techniques – pour plate, spread plate and looping method
10. Phenol co-efficient test
11. Cultural characteristics of microorganisms-colony morphology on nutrient agar slants, nutrients broth
12. Maintenance and preservation of cultures
13. Staining of bacteria-Simple, Negative, Gram, Spore and AFB, Fungal wet mount –LCB-Slide culture method
14. Isolation of halophiles and thermophiles
15. Cultivation of anaerobic micro organisms – Wrights tube – McIntosh fildes jar
16. Micrometry

References

SEMESTER –III
CORE PAPER IV : MICROBIAL PHYSIOLOGY

UNIT – I

Nutrition: Nutritional requirements of microorganisms – Autotrophs, Heterotrophs, Photoautotrophs, Chemoautotrophs, Copiotrophs, Oligotrophs, Endospore formation in Bacteria.

UNIT – II


UNIT -III


UNIT- IV

Anaerobic respiration – sulphur, nitrogenous compounds and Co2 as final electron acceptor. Fermentation – alcoholic, propionic and mixed acid fermentation.

UNIT- V

Photosynthesis – Oxygenic and Anoxygenic, Carbon dioxide fixation, Biosynthesis of bacterial cellwall, biosynthesis of aminoacids ( glutamic acid family )- Bioluminescence.

References
SEMESTER – IV

CORE PAPER V: BIOINSTRUMENTATION – PRINCIPLES AND APPLICATIONS

UNIT – I

Autoclave, Hot air oven, Incubator, Water Bath, Laminar air flow, BOD incubator, Centrifuges – Bench top, High speed, Ultra centrifuge.

UNIT – II

pH meter, Conductivity meter, Lyophilizer, McIntosh anaerobic jar, Biosensor, Metabolic shaker.

UNIT - III


UNIT – IV


UNIT – V

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality, PPM- Ammonium sulphate precipitation.

References
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
SEMESTER IV
GRA CORE PRACTICAL II

1. pH measurements
2. Spectrophotometry
3. Protein estimation (Lowry et al./Bradford)
4. Paper chromatography
5. Thin layer chromatography
6. Electrophoresis - Proteins
8. Extraction of pigments
10. Preparation of Buffers – Acidic and Alkaline range
11. Preparation of Molar solutions
12. Preparation of 0.1 and 1 Normal solutions

SEMESTER -V
CORE PAPER VI - MICROBIAL GENETICS

UNIT-I
DNA-the genetic material, RNA-the genetic material, characters of a genetic material, chemistry & molecular structure of DNA, special structure of DNA, structure and types of RNA.

UNIT-II
Bacterial chromosome, organization of genes in prokaryotes, DNA– replication in prokaryotes – Meselson and Stahl experiment- mechanism & enzymology of replication – theta replication & rolling circle replication.

UNIT-III

UNIT-IV
Mutation-spontaneous and induced-mutagen & mutagenesis – DNA repair mechanism.

UNIT-V
Genetic exchange – transduction(specialized & generalized), transformation, conjugation & Hfr mapping, genetic recombination.

References
2. Freifelder, S., 1987 Microbial Genetics, Jones & Bartlett, Boston.
SEMESTER -V
CORE PAPER VII - PRINCIPLES OF IMMUNOLOGY

UNIT- I

History and Scope of Immunology-The basis of defence mechanisms-Cell and Organs involved in immune system-Phagocytosis.

UNIT- II

Types of immunity-antigen-antibody-types-complement pathways-classical and alternate- Immunoglobins-structure and functions.

UNIT- III

Allergy and hypersensitivity-classification types and mechanisms-autoimmunity-mechanisms and autoimmune response diseases.

UNIT -IV

Quantitative study of antigen-antibody reactions –agglutination, precipitation ELISA-radiimmune assay(RIA)-monoclonal antibodies and its applications(Hybridoma technology)

UNIT –V

Immunohematology-blood transfusion-ABO grouping-Rh factor-Tissue transplantation-HLA typing-mechanism of acceptance and rejection.

References

SEMESTER –V

CORE PAPER VIII - FOOD MICROBIOLOGY

UNIT – I

Food and microorganisms – Important microorganisms in food (Bacteria, mold and yeasts) ; factors affecting the growth of microorganisms in food – pH, moisture, oxidation – reduction potential, nutrient content and inhibitory substances and biological structure.

UNIT – II


UNIT -III

Spoilage of food - cereals, vegetables, fruits, egg and milk – canned foods.

UNIT-IV

Fermented food – pickled cucumber, saurkraut, soysauce, Bread, Idli – Fermented dairy products – Yoghurt and cheese.

UNIT- V

Food borne diseases – food poisoning and food borne infections – bacterial and mycotoxins- Investigation of food poisoning outbreaks- food standards, quality control.

References
SEMESTER –V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY - I

UNIT- I
Gene manipulation – Definition and Application, Restriction Enzymes, Discovery, Types and Mode of Action, Ligases and Methylases.

UNIT -II
Isolation - Purification of DNA (Chromosomal and Plasmid), Isolation and Purification of RNA, Chemical Synthesis of DNA, Genomic Library and cDNA Library.

UNIT -III
Vectors – Plasmid based Vectors- Natural (PSC101, PSF2124, PMB1), Artificial –pBR322 & pUC Construction; Phage based Vectors- λ (Lamda) phage Vectors and its Derivatives: Hybrid Vectors- Phagemid, Phasmid and Cosmid, BAC and YAC.

UNIT -IV
Gene Transfer Techniques: Physical – Biolistic Method, Chemical- Calcium chloride and DEAE Methods, Biological invitro package method - Screening and Selection of recombinants- Direct Method – Selection by Complementation, Marker inactivation Methods, -Indirect Methods- Immunological and Genetic Methods

UNIT- V
PCR, Blotting (Southern, Western, Northen) Techniques, RFLP and Application, - RAPD and Application.- Microarray.

References
SEMESTER – V
APPLICATION ORIENTED SUBJECT - I
RECOMBINANT DNA TECHNOLOGY- II

UNIT – I

Microbial synthesis of commercial products-Proteins-Pharmaceuticals – Interferons - Human growth hormone- Antibiotics -Biopolymers.

UNIT – II

Vaccines – subunit vaccines –Monoclonal antibody. Gene therapy, Regulating the use of Biotechnology

UNIT – III

Transgenic plants-Ti plasmid – insect, virus, herbicide resistant plants – microbial insecticides – bacteria, fungi and viruses.

UNIT IV


UNIT -V

DNA finger printing and its Application.

Human Genome Project and History and its Application, Bioremediation.

References


SEMESTER -VI
CORE PAPER IX - FERMENTATION TECHNOLOGY

UNIT -I

Industrially important strains- Screening methods- Strain development for Improved yield- Mutation, Recombination and protoplasmic fusion.

UNIT -II

Fermentation- submerged and solid state- component parts of a CSTR- types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

UNIT -III


UNIT - IV

Single cell protein- Bakers yeast, spirulina- Details of mushroom development- Oyster (Pleurotus) and Button (Agaricus) mushroom.

UNIT -V

Downstream process- Intercellular and extracellular- Centrifugation, filtration, Floatation- solvent extraction, precipitation- Breakage of cells- physical and Chemical methods.

References


SEMESTER -VI
CORE PAPER X- ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT -I
Distribution of microorganisms in nature – Microbial communities in soil- factors Influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

UNIT -II
Microbial decomposition; cellulose,Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organic wastes- sugarcane wastes-coir pith composition- composting, principles and Applications- conversion process

UNIT- III

UNIT- IV
Water microbiology, algae, phytoplankton- eutrophication- water treatment- Primary, secondary and tertiary. Drinking water- Portability- MPN technique.

UNIT-V
Aero microbiology- aerosol, droplet nuclei, air pollution- sources (Microbiological) – air quality analysis- air sampling devices.

References

SEMESTER -VI
CORE PAPER XI - VIROLOGY

UNIT -I


UNIT- II


UNIT-III


UNIT -IV

Viruses of Eukaryotes- Reproduction of animal and plant viruses- Viruses of Algae, fungi and viruses- viruses and cancer.

UNIT- V

Human viral infections- pathogenicity and diagnosis of Hepatitis (A.B). Mumps, AIDS, Rabies, Influenza, Measles, Rubella, Herpes simplex I&II..

References


SEMESTER -VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - I

UNIT- I
Infections- sources of infections- types of infections- methods of infections-
definitions- epidemic, pandemic, endemic diseases- Epidemiology of infectious
diseases, infectious diseases cycle- investigation of epidemics- control of
epidemics.

UNIT- II
Morphology, pathogenicity and laboratory diagnosis- Gram positive organisms
Staphylococcus aureus, Streptococcus pyogenes, Bacillus anthracis,
Corynebacterium diptheriae.

UNIT- III
Morphology, pathogenicity and laboratory diagnosis- Gram positive
Organisms- Clostridium perfringens, Clostridium tetani.

UNIT- IV
Morphology, pathogenicity and laboratory diagnosis- Gram negative
organisms Escherichia coli, Klebsiella, Proteus, Salmonella, Shigella,
Pseudomonas, Vibrio cholerae.

UNIT - V
Morphology, pathogenicity and laboratory diagnosis- Mycobacterium
Tuberculosis, Mycobacterium leprae, Treponema pallidum, Leptospira,
Chlamydas, Rickettsiae.

References
1. Mackie and Mc catney, 1994, Medical Microbiology No I and II. Churchill
   Livingston, 14th edition.
   Longman.
   Calcutta.
   Mosby Publications.
5. Jawetz E Melnic JL and Adelberg EA 1998, review of Medical Microbiology Lange
   Medical Publications, USA
SEMESTER - VI
APPLICATION ORIENTED SUBJECT - II
MEDICAL MICROBIOLOGY - II

UNIT - I

UNIT - II
Parasitic diseases- Plasmodium vivax, Giardia, Taenia solium, Ancylostoma, Ascaris, Wuchereria bancroftii, Enterobius, Trichuris trichura.

UNIT - III
Etiology and laboratory diagnosis of urinary tract infection- fever of unknown Origin meningitis, diarrhea, respiratory tract infections.

UNIT - IV
Pyogenic infections- Staphylococcus and Pseudomonas: sexually transmitted diseases, nosocomial infections-definition, sources and detection; phage typing, bacteriocin typing.

UNIT - V

References


**SEMESTER VI**  
**GR A CORE PRACTICAL III**

1. Isolation of Nucleic acids  
2. Isolation of drug resistant mutants using UV and Chemical agents  
3. Induction of Lac Operon – ONPG method  
4. Isolation of *E. coli* plasmid DNA by agarose gel electrophoresis  
5. Isolation and identification of major bacterial pathogens – *E. coli, Klebsiella pneumoniae, Proteus, Salmonella, Shigella, Pseudomonas, Staphylococcus aureus* and *Streptococcus pyogenes.*  
6. Identification of clinically important fungi – *Candida albicans, Cryptococcus neoformans* and *Aspergillus*  
7. Methylene blue reduction test  
8. Microbial analysis of spoiled food – Bread and Vegetables  
9. Identification of fungal food spoilers – *Aspergillus, Mucor, Penicillium, Rhizopus*  
10. Direct microscopic examination of curd – observation of lactobacilli  
11. Enzyme production and assay – protease and amylase  
12. Alcohol production / wine  
13. Immobilization- Demonstration  
15. Observation of parasites – *Entamoeba, Plasmodium, Ascaris, Taenia.*  
16. Isolation and titration of coliphages  
17. Cultivation of animal viruses in embryonated eggs.
SEMESTER III
DIPLOMA IN DIAGNOSTIC MICROBIOLOGY

DIPLOMA PAPER 1
ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

UNIT –I

UNIT – II
Laboratory safety. General safety considerations – biohazards and practices specific to microbiology – classification of biological agents on the basis of hazards.

UNIT – III
Special precautions for specific areas of clinical Microbiology – Bacteriology, Mycobacteriology, Mycology, Parasitology, Virology and Serology.

UNIT – IV

UNIT – V
Management of clinical Microbiology laboratory – general approaches – rapid detection – speeding up of identification results and susceptibility results – computerization.

References

1. Diagnostic Microbiology, Bailey & Scott, s, 1990 8th edn. The Mosby Company.

2. Medical laboratory manual for tropical countries, Microbiology by Monica chees brough (ELBS) Tropical health technology butter worth’s, 1985.


SEMESTER IV
DIPLOMA PAPER II
DIAGNOSTIC MICROBIOLOGY – I
(BACTERIOLOGY AND SEROLOGY)

UNIT – I

UNIT – II
Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media.

UNIT – III
Biochemical tests – identification of organisms - Susceptibility testing, reporting of results and interpretation.

UNIT – IV
Serology – Antigen - antibody reactions – Agglutinations (blood grouping, WIDAL), Precipitation (VDRL), Immunodiffusion – mono and double immunodiffusion, Immunoelectorophoresis (rocket, counter current).

UNIT – V
Advanced techniques – automated methods – ELISA, RIA. Aplications of Nucleic acid hybridization, PCR and blotting in diagnosis.

References
SEMESTER V

DIPLOMA PAPER III
DIAGNOSTIC MICROBIOLOGY –II
(VIROLOGY, MYCOLOGY AND PARASITOLOGY)

UNIT –I
Laboratory methods in basic Mycology – Collection and transport of clinical specimens – Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing

UNIT –II
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urino-genital specimen.

UNIT –III

UNIT –IV
Laboratory methods in basic virology- detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

UNIT –V
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses.

References
DIPLOMA PRACTICAL –I

2. Processing of specimen
   2.1- Gram’s Staining
   2.2- Motility
   2.3- Culturing techniques-McConkey agar, Blood agar, Chocolate agar, Mannitol salt agar and XLD agar
4. Susceptibility testing- Kirby Bauer method.

DIPLOMA PRACTICAL –II

1. Slide agglutination - Blood grouping
2. Tube agglutination- WIDAL
3. Precipitation – RPR
4. Immunodiffusion- Radial, Ouchterlony’s
5. Immunoelectrophoresis- Rocket and Counter current
6. ELISA
7. SDS-PAGE
8. Western blot
9. Observation of fungi- LCB or KOH mount
10. Observation of parasites- Entamoeba, Plasmodium, Ascaris, Taenia
MODEL QUESTION PAPERS

CORE PAPER I - FUNDAMENTALS OF MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) Who is called as "Father of Microbiology"?
   a) Robert Koch   b) Louis Pasteur   c) Antony Von Leeuwenhoek   d) Both b & c

2) Immunity mediated by antibodies are called as ________________
   a) Humoral   b) Cell mediated   c) Active   c) Passive

3) ________ is the ability of a lens to separate or distinguish between small objects that are close together.

4) ___________ is used as a counter stain in spare staining
   a) Safranin   b) Methylene blue   c) Malachite green   d) Crystal violet

5) The lowest temperature at which a microbial suspension is killed in 10 minutes is termed as ____
   a) TDP   b) TDT   c) D   d) None of the above.

6) HEPA filters can remove particles of size ________________
   a) 0.2 um   b) 0.3 um   c) 0.4 um   d) 0.5 um

7) McIntosh fildes jar method is used for cultivating ________________
   a) Aerobic organisms   b) Anaerobic organisms   c) Facultative anaerobic organisms   d) Microphilic organisms

8) ________________ is an example for selective media.
   a) Mac conkey agar   b) EMB agar   c) Both  a & b   d) None of the above.

9) TVC refers to ____________
   a) Total viable count   b) Total viral count   c) Total viable colony   c) None of the above.

10) ________________ is an example for short term preservation of microbes.
    a) Agar slant   b) Agar slant   c) Mineral oil overlay   d) a,b & c.

SECTION–B (5X6=30Marks) - Answer ALL Questions.

11) a) Discuss the contributions of Lister, Pasteur and koch to the germ theory of disease and to the treatment or prevention of diseases. (or)
    b) Describe koch's postulates in detail.

12) a) Describe fluorescence microscope (or)
    b) Describe capsule staining.

13) a) Write the principle and application of autoclave. (or)
    b) Comment on phenol coefficient test.

14) a) Comment on pure culture techniques. (or)
    b) How to cultivate anaerobic organism by McIntosh anaerobic jar method.

15) a) Discuss about the CO2 liberation for the estimation of microbes. (or)
    b) Describe short term preservation of microbes.
SECTION–C (5X12=60Marks) - Answer ALL Questions.

16) a) Describe spontaneous generation theory. (or)
   b) Describe germ theory of disease
17) a) Write the principle and application of bright field microscope (or)
   b) Describe gram staining.
18) a) List out the chemical methods of sterilization in detail. (or)
   b) Describe filtration and its types.
19) a) Discus the types of media with eg. for each. (or)
   b) Explain in detail about selective and differential media.
20) a) Describe hemocytometer (or)
   b) Describe the types of long term preservation of cultures.

CORE PAPER II - MICROBIAL DIVERSITY
Duration – 3hrs Maximum – 100 Marks
SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given
1. A population of organisms that descends from a single organism or pure culture is called
   (a) Strain (b) Genus (c) Species (d) Group
2. A treelike diagram that is used to graphically summarise mutual similarities and relationships between organisms is called as
   (a) Pie diagram (b) Similarity matrix (c) Dendrogram (d) None of the above
3. Which of the following is a motile bacterium
   (a) Escherichia coli  (b) Klebsiella  (c) Bacillus subtilis (d) Staphylococcus aureus
4. All the following are true about Mycoplasma except
   (a) Lack cellwall  (b) Colonies have fried egg appearance (c) Require sterols for growth
      (d) Their genome is one of the largest found in prokaryotes
5. The photosynthetic organelles in bacteria is
   (a) Chloroplast (b) Plastid  (c)Thylakoid (d) Pyrenoid
6. Bacteriorhodopsin is present in
   (a) Methanogens (b) Halophiles  (c) Thermophiles (d) Purple sulphur bacteria
7. The sexual spores formed by Agaricus is called
   (a) Ascospores  (b)Zygospores (c) Basidiospores (d) Sporangiospores
8. All the following are asexual spores of fungi except
   (a) Sporangiospores (b) Zygospores  (c) Conidiospores (d) Chlamydomspores
9. The members of phaeophyta are commonly known as
   (a) Red algae  (b) Green algae (c) Blue green algae  (d) Brown algae
10. All the following are true about protozoa except
    (a) All members have cellwall  (b) Move by flagella/pseudopodia
        (c) Unicellular  (d) Some are pathogens
SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) What is serotaxonomy? explain. Or
   (b) Describe any two important characteristics used in serotaxonomy.
12. (a) Give distinguishing characters of clostridium. Or
    (b) State the important features and significance of enterobacteria.
13. (a) Compare the cell walls of eubacteria and archaeabacteria. Or
    (b) Discuss the important features of green sulphur photosynthetic bacteria with suitable examples
14. (a) Explain the life cycle of Mucor. Or
    (b) Describe briefly the life cycle of Dictyostelium
15. (a) Give a brief account of pseudopodia. Or
    (b) Explain the general characters and the importance of Euglenophyta

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16. (a) What is numerical taxonomy? Describe. Why are computers so important to this approach Or
    (b) List out and describe the genetic characters used in taxonomy.
17. (a) What are the general characteristics of actinomycetes? Describe. Or
    (b) Give a detailed account of Bergey's Manual and its importance.
18. (a) Summarise the major characteristics of archaeabacteria. Or
    (b) Classify the photosynthetic eubacteria listing out their important features with suitable examples
19. (a) Discuss in detail the general characteristics of fungi. Or
    (b) With neat diagram describe the life cycle of Agaricus.
20. (a) Describe the general characters and the importance of Chlorophyta and phaeophyta. Or
    (b) Explain the general characters of sporozoa with suitable diagram. Discuss its significance.

CORE PAPER III -CELL BIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The chemical nature of Gram negative bacteria
   (a) Peptidoglycan  (b) Lipopolysaccharide  (c) Peptidoglycan + Lipopolysaccharide+ compounds  (d) other compounds
2. Polarly flagellated bacteria is known as ---------
   (a) Lophotrichous  (b) Peritrichous  (c) Atrichous  (d) Axial filaments
3. Where does energy production occur in eukaryotes?
   (a) Cytoplasmic membrane (b) Mitochondria
   (c) Polyphosphate granules (d) Periplasmic space
4. Features of nuclear envelope includes
   (a) Ribosomes (b) A double membrane structure
   (c) Communication with cytoplasm (d) Both b & c.
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c) M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage (b) Plasmid (c) Plasmid and phage (d) Fungi
7. Linked transport of two substances in the same direction is called
   (a) Antiport (b) Facilitated diffusion (c) Symport (d) Passive diffusion
8. Facilitated diffusion mechanism are found most commonly in
   (a) Eukaryotic cells (b) Prokaryotic cells (c) Both a & b (d) None of the above
9. The bacteria that thrive at sodium chloride concentration above 15% are known as
   (a) Halophiles (b) Extreme thermophiles (c) Acidophiles (d) Osmophiles
10. In Archaebacteria the lipids are linked by
    (a) Monomer linkage (b) Ether linkage (c) B 1-4 linkage (d) Ionic linkage

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11. (a) Describe the capsule and slime layer of prokaryotic cell. Or
    (b) Write a note on reserve materials.
12. (a) Explain the structure and functions of Endoplasmic reticulum. Or
    (b) Write short notes on Nucleus.
13. (a) Give an account on cDNA synthesis. Or
    (b) How will you purify plasmid DNA?
14. (a) Explain Facilitated diffusion. Or
    (b) Write a note on phagocytosis and pinocytosis.
15. (a) Write a note on cell wall of Archaebacteria. Or
    (b) What are methanogens? Exemplify the role with examples.

SECTION–C(5X12=60Marks)
Answer ALL Questions.

16. (a) Briefly comment on the differentiation of a Gram positive and Gram negative bacterial cell wall and its organization. Or
    (b) Discuss the membrane systems in a bacterial cell with a note on their significance.
17. (a) Explain the structure and functions of Mitochondria and Chloroplast.. Or
    (b) Write a brief account on eukaryotic cell wall.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
    (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Write a brief note on active transport of nutrients in a bacterial cell. Or
    (b) Give a brief account on group translocation mechanism.
20. (a) Give a brief account on Halophiles. Or
    (b) Give a brief account on Thermoacidophiles.
CORE PAPER IV - MICROBIAL PHYSIOLOGY

Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given.

1. Photoautotrophs use ------- as source of energy
   (a) Water (b) Pigments (c) Light (d) H2S
2. *Thiobacillus thiooxidans* is an example of--------
   (a) Chemoautotrophs (b) Heterotrophs (c) Photoautotrophs (d) Copiotrophs
3. The organisms which tolerate high pressure are called
   (a) Halotolerant (b) Barotolerant (c) Psychrophilic (d) Thermotolerant
4. Chemostat is associated with
   (a) Synchronous culture (b) Batch culture (c) Continuous culture (d) Diauxic growth
5. All the following are intermediates of TCA cycle except
   (a) Citric acid (b) Fumaric acid (c) Lactic acid (d) Ketoglutaric acid
6. The two enzymes, transketolase and trans aldolase are unique to which of the following pathways?
   (a) EMP (b) ED (c) HMP (d) TCA cycle
7. Methane is formed when ---- acts as final electron acceptor
   (a) Sulphur compound (b) Oxygen (c) Nitrogenous compound (d) Carbon dioxide
8. Which of the following carries out mixed acid fermentation?
   (a) *Saccharomyces cerevisiae* (b) *Chlorella sp* (c) *Klebsiella sp* (d) *Escherichia coli*
9. Which of the following is the electron donor in anoxygenic photosynthesis?
   (a) Water (b) Sunlight (c) H2S (d) O2
10. The carrier molecule in cell-wall biosynthesis is a----
    (a) Lipid (b) Carbohydrate (c) Protein (d) None of the above

SECTION –B(5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on chemoautotrophic bacteria. Or
    (b) What are copiotrophs? Describe with suitable examples.
12. (a) What is synchronous growth? Explain any one method of obtaining synchronous growth. Or
    (b) Give an account on Diauxic growth.
13. (a) Giving suitable example , describe substrate level phosphorylation. Or
    (b) Describe ED pathway.
14. (a) Describe alcoholic fermentation. Or
    (b) Write a brief note on anaerobic respiration with nitrogenous compounds as electron acceptors.
15. (a) What is anoxygenic photosynthesis? Describe. Or
    (b) Give a brief note on Bioluminescence.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. (a) With neat diagram, describe the event of endospore formation in bacteria. Or
    (b) With suitable examples, classify bacteria based on their nutritional requirements.
17. (a) Discuss in detail the different phases of growth. Or
    (b) List out the factors that influence microbial growth and describe any three in detail.
18. (a) Describe EMP pathway. What is the net gain of ATP through EMP pathway? Or
(b) What is oxidative phosphorylation? Describe.
19. (a) Explain briefly the propionic acid fermentation. Or
(b) Explain the pathway of anaerobic respiration with Co2 as final electron acceptor.
20. (a) Describe the biosynthesis of Gram positive bacterial cell wall. Or
(b) Describe the C3 pathway of Co2 fixation.

CORE PAPER V - BIOINSTRUMENTATION-PRINCIPLES AND APPLICATIONS

Duration – 3hrs                           Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given.
1. Hot air oven functions based on the principle of
   a. dry air sterilization  b. moist air sterilization  c. membrane filtr  d. chemical sterilization.
2. Moist heat sterilization is achieved by
   a. lyophilization  b. incineration  c. autoclave  d. oven.
3. Lyophilization is the
   a. separation of proteins  b. sudden freezing and dehydration  c. enzyme reaction by oxidation  d. high pressure–segmentation.
4. The pH is defined as
   a. logH+  b. log2H+  c. -logH+  d. -log2H+
5. Which is used as an absorbent in TLC.
   a. KCl solution  b. lead sulphate  c. anions  d. silica gel
6. SDS-PAGE is used to separate
   a. nucleic acid  b. lipid  c. protein  d. carbohydrate.
7. UV light is significantly absorbed by
   a. coloured solution  b. nucleic acid  c. proteins  d. enzymes.
8. NPK analysis is done using
   a. electrophoresis  b. centrifugation  c. flame photo  d. chromatography.
9. The pH of the blood is
   a. 6.3  b. 7.4  c. 7.0  d. 7.6
10. What is the normality of 5M NaOH solution?

SECTION-B(5X6=30Marks) - Answer ALL Questions.
11.a. With a schematic diagram, describe the working of a laminar flow chamber. (or)
   b. Explain the working of an incubator.
12.a. Explain the electrodes used in pH measurement. (or)
   b. Describe the procedure to provide atmosphere and facilitate anaerobic bacterial growth.
13.a. What is paper chromatography? (or)
   b. Describe the procedure for separation of proteins by SDS-PAGE.
14.a. Write down the principle and applications of Flame photometry. (or)
b. Write a note on NPK analysis.

15.a) The specific volume of solid ammonium sulphate is 0.565ml /g. the solubility of ammonium sulphate at 0°C is 706g/1000g water. Calculate
   i. the concentration of ammonium sulphate in a saturated solution at 0°C.
   ii. the amount of solid ammonium sulphate that must be added at 0°C to 500 ml of a “40 % saturated” solution to bring it to “60% saturation.”
   (or)
b. Define buffer. State the role of phosphate and acetate buffer in pH regulation.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Discuss the principle, types and applications of centrifuge. (or)
b. Describe the instruments used for wet and dry sterilization.

17.a. Describe the different types of biosensors and their applications. (or)
b. What is lyophilization? How is it done in the laboratory? What are its applications?

18.a. Explain Ion exchange chromatography. (or)
b. Discuss the principle and methodology of affinity chromatography.

19.a. Explain the principles of Spectrophotometry. What are the specific advantages of UV-Visible spectrophotometer over a special colorimeter? (or)
b. Discuss the principle and applications of turbidometry.

20.a. What is a buffer solution? State the common buffer compounds used in biology.
   with their applications (or)
b. Explain about the concentrations based on volume - molarity and normality. Also explain how they are related.

CORE PAPER VI - MICROBIAL GENETICS

Duration – 3hrs maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1) Experiments was conducted in ------- to prove that the RNA also act as genetic material
   a) TMV b) Retrovirus c) Pox d) Bacteriophage

2) Which form of DNA is prevalent in living cells?
   a) A b) B c) C d) Z

3) ---------Enzyme resolves the super coiling during replication of E.Coli
   a) gyrase b) helicase c)polymerase d) primase

4) Semi conservative mode of replication was demonstrated by
   a) Jacob & Monad b) Tautam &Lederberg c) Meselson &stahl d) Hershey & Chase

5) --------- no of codons constitute the coding dictionary
   a) 64 b) 61 c) 62 d) 60
6) CAP is involved in----------?
   a) Catabolic repression  b) Induction c) feedback inhibition  d) None of these
7) ---------is an example for intercalating agent?
   a) Acridine orange  b) EMS  c) Nitrous oxide  d) UV
8) Lex protein are involved in ----type of repair?
   a) SOS  b) photoreactivation  c) Exision repair d) all of the above
9) Davis-u-tube exp is used to prove the existance of--------?
   a) Transformation  b) conjugation  c) transduction d) recombination
10) Transformation was proved and demonstrated by-----
    a) Griffith  b) Sanger  c) Grick  d) Watson

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11) a) Elucidate the structure of DNA  OR
    b) Discuss the characters of a genetic material
12) a) Prove that replication is semi conservative by a suitable experiment  OR
    b) Describe DNA polymerase
13) a) Explain the features of genetic code  OR
    b) Discuss attenuator control in trp operon
14) a) Discuss Amo’s test  OR
    b) Discuss photoreactivation
15) a) Discuss briefly specialized transduction  OR
    b) Describe Holiday model of recombination

SECTION–C (5X12=60Marks) - Answer ALL Questions.
16) a) Explain the experiments that led to the establishment of DNA as genetic material  OR
    b) Explain the different forms of DNA
17) a) How the naked DNA is condensed and organized in a prokaryotic cell?  OR
    c) Describe the mechanism involved in DNA replication with a special emphasis on the
       enzyme involved
18) a) List and explain the negatively controlled operon in E.Coli  OR
    b) Describe the mechanism involved in the transformation of information from DNA to
       RNA
19) a) Explain how the organism protects its DNA from damage?  OR
    b) Explain the phenomenon involved in generation of mutants?
20) a) Describe the process involved in genetic exchange which depends on physical contact
    between cells and how it is exploited in mapping gene
    OR
    b) Explain the phenomenon involved in generation of genetic variation by the uptake of
       naked DNA?
CORE PAPER VII  -PRINCIPLES OF IMMUNOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) Who is called as "Father of Modern immunology"?
   a) Antony Von Leewenhock  b) Robert Kock  c) Louis Pasteur  d) Edward Jenner
2) Formation and development of red and white blood cells from stem cells is called as ______
   a) Hemopoiesis  b) Hematopoiesis  c) Hemoglobin  d) None of the above.
3) __________________ are substances that, when mixed with an antigen and injected with it, serve to enhance the immunogenicity of that antigen.
   a) Antibody  b) Haptens  c) Adjuvants  d) Epitopes
4) __________________ is the immunoglobulin which can cross the placenta.
   a) IgA  b) IgD  c) IgM  d) IgG
5) Type I hypersensitivity is otherwise called as __________________
   a) Cell Stimulating  b) Delayed type  c) Anaphylactic  d) Toxic complex disease.
6) LATS refer to ______
   a) Lymphatic thyroid stimulator  b) Long acting thyroid stimulator
   c) Lymph acting thyroid stimulator  d) None of the above.
7) The antibody causing agglutination is called as __________________
   a) Precipitin  b) Agglutinin  c) Agglutinogen  d) Agglutin
8) The antigen whose concentration is to be determined in RIA is termed as _____
   a) Ligand  b) Analyte  c) Both a & b  d) None of the above.
9) Grafts between two genetically non identical members of the same species are called as ______
   a) Allografts  b) Autograft  c) Isograft  d) Xenograft
10) The method of transferring immunity by means of lymphoid cells is known as ______
    a) Adoptive immunisation  b) Adaptive immunisation  c) Combined  d) None of the above.

SECTION–B(5X6=30Marks) - Answer ALL Questions.

11) a) Write in detail about the role of thymus.  (or)
    b) Describe phagocytosis process.
12) a) Comment on classical complement pathway.  (or)
    b) Describe IgG antibody.
13) a) Explain type IV hypersensitivity reaction.  (or)
    b) Comment on autoimmune disorders.
14) a) Give a brief note on RIA  (or)
    b) Give a detailed account on hybridoma technology.
15) a) Comment on Rh blood group system.  (or)
    b) Write a detailed note on the immunologic basis of allograft rejection.

SECTION–C(5X12=60Marks) - Answer ALL Questions.

16) a) Describe inflammatory barrier  (or)
    b) Define and describe MALT.
17) a) Describe the types of immunity.  (or)
    b) Comment on abnormal immunoglobulins
18) a) Describe the primary and secondary mediators of anaphylaxis  (or)
    b) Give a detailed note on the classification of autoimmune diseases.
19) a) Describe the mechanism and application of precipitation reaction. (or)
   b) Describe ELISA.
20) a) Give a detailed note on ABO blood group system. (or)
   b) Give a brief note on the mechanisms involved in graft rejection.

CORE PAPER VIII - FOOD MICROBIOLOGY

Duration – 3hrs
Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. The low pH of the fermented food products is due to the accumulation of
   (a) lacti             (b) pyruvic acid   (c) fumaric acid   (d) aminoacids
2. All the following genera of bacteria produce pigments except
   (a) Serratia     (b) Flavobacterium   (c) Micrococcus   (d) Klebsiella
3. The high temperature short time (HTST) method of pasteurization employs a temperature time
   combination of
   (a) 62.8°C, 30 min   (b) 62.5°C, 30 min   (c) 71.7°C, 15 sec   (d) 71.7°C, 15 min
4. Ropiness of bread is caused by species of
   (a) Aspergillus     (b) Bacillus       (c) Saccharomyces   (d) Serratia
5. Filtration is a suitable method of removal of microorganisms from the following except
   (a) beer           (b) sauerkraut   (c) soft drinks   (d) fruit juice
6. A can with a minute leak during storage is called a
   (a) breather       (b) springer   (c) flipper   (d) sparger
7. The term leavening is associated with the preparation of
   (a) soy sauce   (b) yoghurt   (c) bread   (d) cheese
8. All the following organisms contribute to acidity in idli batter except
   (a) Leuconostoc mesenteroides   (b) Streptococcus faecalis   (c) Pediococcus cerevisiae   (d) Staphylococcus aureus
9. Which of the following should be avoided while investigating food poisoning outbreaks
   (a) collection of sample   (b) storage of sample at room temperature for 24 hr   (c) gathering information   (d) laboratory testing
10. The toxin produced by Staphylococcus sp in food is
    (a) an enterotoxin   (b) a neurotoxin   (c) a hepatotoxin   (d) a nephrotoxin.

SECTION B (5X6=30 Marks) - Answer ALL Questions.

11a) What is the significance of molds in food microbiology? Describe. (or)
    b) Why are yeasts important in food microbiology? Discuss any 3 beneficial and harmful effects.
12a) Discuss the drying process as a method of food preservation. (or)
    b) Explain the role of radiation in food preservation.
13a) What are the various rots of eggs produced by bacteria? Describe. (or)
    b) Describe the colour changes in milk due to the growth of spoilage microorganisms.
14a) Describe briefly the production of soy sauce. (or)
    b) How is yoghurt prepared? Explain.
15a) Write about any one type of food poisoning caused by bacteria. (or)
b) Give a brief account of food standards.

SECTION–C(5X12=60Marks)
Answer ALL Questions.
16a) Discuss the importance of bacteria in food microbiology with suitable examples (or)
b) What are the various factors that influence the growth of microorganisms in foods.
17a) Discuss the use of high temperature in food preservation. (or)
b) Discuss the principles of food preservation.
18a) Write in detail about any six types of organism responsible for spoilage of vegetables (or)
b) Discuss the biological spoilage of canned foods.
19) a) How is pickled cucumbers prepared? Describe. Add a note on the defects. (or)
b) With neat flow chart describe the production of cheese.
20a) Describe in detail about food borne infections caused by bacteria. (or)
b) What are mycotoxins? Describe in detail with suitable examples.

APPLICATION ORIENTED PAPER - I
Duration – 3hrs Maximum – 75 Marks
RECOMBINANT DNA TECHNOLOGY - I

SECTION A ( 10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. GAATTC is the recognition sequence of
   (a) BamHI    (b) EcoRI   (c) HindIII  (d) HaeIII
2. An example of a ligase capable of both blunt and cohesive end ligation is
   (a) T4 ligase    (b) E.coli ligase (c) Sal ligase (d) All
3. Phosphoramidite method is used for the synthesis of
   (a) DNA     (b) Protein (c) Phosphatase (d) Phosphoric acid
4. Plasmids are DNA strands which are
   (a) Extrachromosal (b) Double stranded (c) Self replicating (d) All the above
5. Insertional vectors are derived from
   (a) Bacterial plasmid (b) Phage lambda (c)M13 Phage (d) Yeast plasmid
6. Cosmid are novel vector that combines the features of
   (a) Phage     (b) Plasmid (c) Plasmid and phage (d) Fungi.
7. Colony hybridization technique is employed for
   (a)Selection of vector (b)Unhybridised ones (c)Selection of desirable clones (d)None of the above
8. The introduction of DNA into a single eukaryotic cell with a fine needle
   (a) Electroporation (b) Microinjection
   (c) Transformation (d) None
9. Taq polymerase is isolated from
   (a) Thermophilus aquaticus (b) Thermus aquaticus
   (c) Thermobacter aquaticus(d) Thermus aquaticae
10. Hybridization technique used to detect protein in a gel is
    (a) Southern blot   (b) Northern blot   (c) Western blot   (d) Eastern blot
SECTION–B(5X5=25Marks) - Answer ALL Questions.
11. (a) Define cloning. Explain the various steps involved in cloning. Or
   (b) Explain the action of Methylases.
12. (a) Write a note on YAC. Or
   (b) Explain a typical cosmid vector.
13. (a) Give an account on cDNA synthesis. Or
   (b) How will you purify plasmid DNA?
14. (a) How alpha complementation of lac Z helps one to identify clone? Or
   (b) How will you identify a recombinant DNA by immunological assay?
15. (a) Explain Northern blotting technique. Or
   (b) Give an account on RAPD.

SECTION–C(5X8=40Marks) - Answer ALL Questions.
16. (a) Define restriction enzyme and add a note on classification and its uses. Or
   (b) Give a brief account on ligases.
17. (a) Explain the construction of cDNA and DNA library. Or
   (b) Explain the chemical synthesis of DNA in laboratory.
18. (a) Explain the strategy of gene cloning using bacterial plasmids with an example. Or
   (b) Give a brief account on lambda phage derived cloning vectors.
19. (a) Give a detailed account on gene transfer techniques. Or
   (b) How will you identify the presence of r DNA in a cell?
20. (a) Explain Southern blotting technique and its applications. Or
   (b) Explain the principle and method of PCR and its applications.

APPLICATION ORIENTED PAPER - II
RECOMBINANT DNA TECHNOLOGY - II
Duration – 3hrs
aximum – 75 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1) -------------- are broad spectrum antiviral products
   a) Histones  b)IFN  c) Streptomycin  d)Nystatin
2) Xanthan gum is produced from
   a) Pseudomonas putida  b) Xanthomonas campestris  c)Xanthococcus  d) Zymomonas
3) -------------- is involved in the fusion of myloma cells with spleen cells
   a) PEG  b)PGA  c) IPTG  d) EtBr
4) Vaccines that require a carrier molecule for its activity is called as ----------
   a) Subunit  b) Whole cell  c) Antiidiotype  d) Peptide
5) -------------- required for the transfer of the T DNA from A. tumifacience to plant cells
   a) vir genes  b) Right border  c) Left border  d) IAA
6) Nopaline is --------------
   a) Unusual Amino acid  b) Nucleotide  c) Vitamin  d) Coenzyme
7) Example of an animal model involved in transgenesis
   a) Monkey  b) Snake  c)Dinosaurs  d) Mice
8) -------------- method is involved development of transgenic animal
   a) Microinjection  b) Protoplast fusion  c) Hybridoma technology  d) b and c
9) -------------- marker are involved in DNA Fingerprinting
   a) VNTR  b) RFLP  c) RAPD  d) STR3
10) Father of HGP
    a) Francis Collins  b) Venter  c) James Watson  d) Hunkapillar

SECTION – B (5X5=25Marks) - Answer ALL Questions.
11a) Write a brief account on commercial biosynthesis of interferons (or)
    d) List the us Human growth hormone and brief on its commercial production
12a) Give a short note on Antidiotype vaccine (or)
    b) List the uses and application of monoclonal antibodies
13a) Explain in short the application ad development of transgenic sheep (or)
    b) Transgenic mice; DNA microinjection method of development- explain
14a) Explain in short about Ti based cointegrate vectors (or)
    b) Detail the Biochemistry and the mode of action of Bt toxin
15a) List the scope and application of HGP (or)
    b) What is Bioremediation? How does r DNA technology influences it?

SECTION – C (5X8=40Marks) - Answer ALL Questions.
16a) Write an essay on the commercial synthesis of small proteins (or)
    b) Discuss microbial synthesis of Biopolymers
17a) Discuss the protocol involved in production of Monoclonal Antibodies (or)
    b) Explain the method and application of gene therapy
18a) Discuss about Microbial insecticides (or)
    b) Elucidate methods involved in generation of insect, virus, resistant plants
19) a) Discuss methodologies involved in the creation of transgenic mice also add
    brief note on its application (or)
    b) Discuss about transgenic- goat, pig, birds and fish
20a) Write a detailed essay on DNA Fingerprinting and its application (or)
    b) Give a detailed essay explaining the course leading to the achievement of HGP

CORE PAPER IX – FERMENTATION TECHNOLOGY
Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Erlenmeyer flasks are used in fermentation process during
   a. secondary screening  b. strain improvement  c. pilot scale  d. commercial operation
2. Glutamic acid is used for
   a. feed supplement  b. flavour enhancer  c. ethanol production  d. antibiotic fermentation
3. Steady state is achieved in _____________ fermentation.
   a. batch  b. fed-batch  c. continuous  d. all
4. Batch culture is a______________
   a. open culture system    b. system that maintains constant cell conc.
   c. system with addition of nutrients    d. closed culture system
5. Streptomycin fermentation by S. griseus produces
   a. Vitamin B2 as a by product    b. Vitamin B12 as a by product
   c. Vitamin C as a by product    d. Biotin as a by product
6. Antibiotics by microbes are usually elaborated at --------- stage of their growth.
   a. lag    b. log    c. stationary    d. decline
7. The term single –cell protein was coined at---------- in 1966
   a. CFTRI, Mysore    b. Massachusetts Institute of technology
   c. MTCC    d. Imperial chemical Industries.
8. __________ was at one time the most important substrate for SCP production
   a. methanol    b. methane    c. oil    d. coal
9. Which of the following steps does not come under down stream processing
   a. product recovery    b. quality control    c. sterilization    d. packaging
10. Crystallization is an established method employed in the initial recovery of
    a. organic acid    b. amino acid    c. both    d. none

SECTION–B(5X6=30Marks) - Answer ALL Questions.
11.a. Discuss the significance of microbes in the production of commercially important products.
    (or)  b. Write a short note on the isolation of alkaline protease producers from soil.
12.a. Explain briefly batch culture   (or)
    .b. Differentiate submerged and solid state fermentation.
13.a. Describe in detail fungal protease production.   (or)
    b. Discuss the methods of immobilization and add a note on its significance.
14.a. Describe the role of yeast in bread making   (or)
    b. Write about single cell protein.
15.a. Discuss the methods distruption of cells by physical methods.   (or)
    b. Write short notes on batch filters that are employed in down streaming processing.

SECTION–C(5X12=60Marks) - Answer ALL Questions.
16.a. Give a detailed account on the various methods of strain improvement   (or)
    b. Discuss the methods for screening of industrially important microorganism
17.a. Give a detailed account on the components and usage of stirred tank reactor and air-lift fermentor.   (or)
    b. Give a detailed account on solid state fermentation with its applications.
18.a. Elaborate on the various steps involved in beer production.   (or)
    b. Write an essay on the commercial production in beer production.
19.a. Explain briefly the industrial application of yeast.   (or)
    b. Describe in detail the development of Oyster mushroom.
20.a. Describe in detail the recovery and purification of intracellular products with examples.   (or)
    b. Down stream processing-a multistage operation. Discuss.
CORE PAPER X - ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1) In a Microbial population if one population is benefited and the other is neither benefited nor affected is
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Synergism

2) Mycorhizal association is an example of
   a) Ammensalism  b) Commensalism  c) Parasitism  d) Symbiosis

3) ------------------ is an example of recalcitrant compound
   a) Lignin  b) Protein  c) Carbohydrate  d) Lipid

4) Fermentation is an an example for ------------------ degradation
   a) Aerobic  b) Anaerobic  c) a and b  d) None of the above

5) ------------------ is a cellulolytic bacteria
   a) Pseudomonas  b) Klebsiella  c) Mycoplasma  d) Zymomonas

6) Rhizobium  exist as ------------------ in the nodules
   a) Protoplast  b) Bacterioides  c) Mycoplasma  d) None of the above

7) Azospirillum is an example for
   a) Free living  b) Symbiotic  c) associative  d) all the above

8) According to the American standard of potability -------------- number of E.coli can present in 100 ml of water
   a) 1  b) 0  c) 10  d) 100

9) Application of alum is in -------------- phase of water treatment

10) Super Bug was developed and patented by
    a) Khorana  b) Kohnberg  c) Chakraborthy d) Sanger

SECTION-B(5X6=30Marks) - Answer ALL Questions.

11a) Discuss in brief in about Ammensalism (or)
    b) List the factors influencing density of microbes in soil

12a) Discuss the biology of composting (or)
    b) Comment on microbial decomposition of lignin

13a) Write short notes on biofertilizers (or)
    b) Explain carbon cycle

14a) Discuss MPN technique (or)
    b) Explain Eutrophication

15a) Describe Air pollution (or)
    b) Explain the methodology involved in Microbiological Air quality

SECTION-C(5X12=60)Marks) - Answer ALL Questions.

16a) Discuss different types of microbial association (or)
    b) Comment on microbial communities in the soil

17a) Explain aerobic and anaerobic degradation (or)
    b) Write an essay on dynamics of soil microbes

18a) Detail on symbiotic nitrogen fixation which involves root nodules (or)
    b) Explain phosphorus and sulphur cycle

19a) Write a detailed essay on water treatment (or)
    b) Explain the microbial composition and dynamics of aquatic ecology

20a) Write an essay on air sampling devices (or)
    b) Discuss the Microbiology of air and its mode of sustenance and pathological implication of the suspended microbes
CORE PAPER XI - VIROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given

1. Who discovered the TMV?  (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) M. Theiler

2. The spikes are otherwise (a) Peplomers  (b) Capsid  (c) Envelope  (d) Coat

3. The one step growth experiment was developed by (a) Bejerinck  (b) D. Ivanowski  (c) W. Stanley  (d) Max Delbruck and Emory Ellis

4. Single stranded DNA phage is (a) T4 phage  (b) MS2  (c) QB  (d) O X 174

5. The process of release of the prophage from the bacterial DNA is called (a) Conduction  (b) Transfection  (c) Insertion  (d) Induction

6. The int gene codes for the synthesis of an ---------- enzyme
   (a) Integrase  (b) Ligase  (c) Excisionase  (d) Replicase

7. TMV has a Linked transport of two substances in the same direction is called (a) Non – infectious ss RNA  (b) Infectious ss RNA  (c) Non – infectious ss DNA  (d) Infectious ss DNA

8. Plant viruses penetrate the host cells through (a) Endodesmata  (b) Pore  (c) Echodesmata  (d) None of the above

9. In Herpes viridae the viral envelope adsorbs to the receptors on (a) Plasma membrane  (b) Cytoplasm  (c) Nucleus  (d) None of the above

10. For measles, the immunogen is (a) Active but attenuated  (b) Inactive but attenuated  (c) Inactive heat killed  (d) Inactivated

SECTION – B (5X6=30Marks) - Answer ALL Questions.

11. (a) Give an account on cultivation of viruses in egg yolk region.  Or
    (b) Write a note on viral envelopes and enzymes.

12. (a) Explain the one step growth experiment.  Or
    (b) Give an account on the structure of a typical bacterial virus.

13. (a) Give an account on reproduction of RNA phage.  Or
    (b) Describe lysogenic conversion and its significance.

14. (a) Write a note on penetration and uncoating of viruses in the animal cell.  Or
    (b) Write a note on characteristics of the viruses that infect algae and fungi.

15. (a) Write short notes on AIDS.  Or
    (b) Give a brief outline on Rubella virus.

SECTION – C (5X12=60Marks) - Answer ALL Questions.

16. (a) Give a detailed account on viral purification and assay methods.  Or
    (b) Give a brief account on the early development of virology.

17. (a) Explain briefly the reproduction of ds DNA T4 phage.  Or
    (b) Give a detailed account on ss DNA phage.

18. (a) Describe the temperate bacteriophages and lysogeny.  Or
    (b) Give a brief account on generation of defective phages and their uses.

19. (a) Explain briefly the reproduction of plant viruses.  Or
    (b) Give a detailed account on viruses and cancer.

20. (a) State the pathogenecity and laboratory diagnosis of Hepatitis B virus.  Or
    (b) Explain the pathogenecity and laboratory diagnosis of Rabies virus.
APPLICATION ORIENTED PAPER – III
MEDICAL MICROBIOLOGY – I

Duration – 3hrs Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. An example of zoonotic disease  a. Malaria  b. filariasis  c. plaque  d. all the above
2. Persons with symptomless infection is called
   a. immuned  b. carrier  c. vector  d. resistant
3. The commonest cause of localized suppurative lesion in man is
   a. streptococci  b. staphylococci  c. Pseudomonas  d. Vibrio
4. Toxigenecity of C.diphtheriae is determined by
5. Spot the Gram positive anaerobic endospore forming bacillus
   a. Lactobacillus  b. Corynebacterium  c. Clostridium  d. Mycobacterium
6. Clostridium tetani is the causative agent of
   a. anthrax disease  b. lock jaw  c. hepatitis  d. rabies
7. Food borne intoxication is caused by a. Salmonella  b. E.coli  c. Shigell  d. Staphylococcus
8. Darting motility is seen with a. E.coli  b. Streptococcus  c. V.cholerae  d. S.typhi
9. Which one of the following media is used for the cultivation of M.leprae
   a. SS agar  b. BSA  d. LJ  d. TCBS
10. The specimen generally used for suspected pulmonary tuberculosis is
    a. faeces  b. urine  c. sputum  d. blood

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11.a. Define and differentiate carriers. (or)
      b. State Koch postulates.
12.a. Give the features of Streptococcus. (or)
      b. Give the features of B.anthracs
13.a. Describe the methods for diagnosis to tetanus (or)
      b. Describe the methods for diagnosis of gas gangrene.
14.a. Write a short note on enteric fever. (or)
      b. Write a short note on bacillary dysentery.
15.a. Give the features of Chlamidiae. (or)
      b. Give the features of Rickettsiae.

SECTION–C(5X8=40Marks) - Answer ALL Questions.

16.a. Elucidate the methods of transmission of infection with examples. (or)
      b. As a microbiologist how would you take up an investigation of epidemics? Add a note on control measures you would adopt with a suitable case study.
17.a. Give a detail account on diphtheria with a clear profile on the causative organism. How would you diagnose the same? (or)
      b. Give an account of Staphylococcus aureus its morphology and diagnosis.
18.a. Describe the morphology, pathogenicity and laboratory diagnosis of C.tetani. (or)
      b. Describe the morphology, pathogenicity and laboratory diagnosis of C.perfringens.
19.a. Describe the morphology, pathogenicity and laboratory diagnosis of E.coli. (or)
      b. Describe the morphology, pathogenicity and laboratory diagnosis of V.cholerae.
20.a. Comment on the pathogenicity and laboratory diagnosis of T.pallidum. (or)
      b. Describe the morphology, pathogenicity and laboratory diagnosis of M. tuberculosis.
APPLICATION ORIENTED PAPER–II : MEDICAL MICROBIOLOGY– II

Duration – 3hrs Maximum – 75 Marks

SECTION A ( 10 x 1= 10 Marks) - Choose the correct answer for each from the FOUR alternatives given

1. A tangled mass of hyphae is called as ________________
   a) Hypha   b) Mycelium   c) Mould   d) Fungi

2. ________________ is an important opportunistic pathogen in HIV infected persons.
   a) P. marneffci   b) P. notatum   c) Rhizopus   d) Mucor

3. Candidosis is caused mainly by _____________
   a) C. albicans   b) C. tropicalis   c) C. pseudotropicalis   d) C. krusei

4. The major organism which causes urinary tract infection is ________________
   a) E. coli   b) Salmonella   c) Shigella   d) Klebsiella

5. Traveller's diarrhea is caused by ________________
   a) Enteropathogenic E. coli   b) Enterotoxigenic E. coli
   c) Enteroinvasive E. coli   d) Enterotoxigenic E. coli

6. Blue pus is caused by _______ a) Pseudomonas b) Vibrio    c) Salmonella d) E. Coli

7. Sexually transmitted disease is caused by ______________
   a) Treponema b) Klebsiella c) Proteus   d) Pseudomonas

8. Invasion of microorganisms into the bloodstream is called as____________
   a) Septicemia   b) bacteremia   c) Viremia   d) Algemia

9. MIC denotes ______________
   a) Maximum inhibitory concentration   b) Minimum inhibitory concentration
   c) Multiple inhibitory concentration   d) None of the above

10. Endoflagella is a characteristic nature present in ______________
    a) Spirochetes b) Salmonella   c) Proteus   d) E. coli

SECTION–B(5X5=25Marks) - Answer ALL Questions.

11. a) Comment on superficial infection. (or)
    b) Describe candidiasis

12. a) Comment on Taenia solium (or) b) Give a brief note on Ascaris.

13. a) Describe the etiology and laboratory diagnosis of urinary tract infections. (or)
    b) Describe respiratory tract infections.

14. a) Describe briefly on pyogenic infections. (or) b) Comment on Pseudomonas.

15. a) Explain the mechanism of drug resistance (or)
    b) Give a brief note on disc diffusion test.

SECTION–C(5X8=40 Marks) - Answer ALL Questions.

16. a) Add a note on opportunistic fungal infections (or)
    b) Aspergillosis Describe.

17. a) Describe Trichus trichura (or)
    b) Comment on Wucheraria bancrofti

18. a) Describe the etiology and lab diagnosis of diarrhegenic E.Coli (or)
    b) Comment on pyogenic infections caused by Staphylococcus.

19. a) Comment on meningitis (or) b) Describe pyrexia

20. a) Describe drug resistance nature of bacteria
    b) Comment on Kirby Bauer antibiotic sensitivity test.
DIPLOMA PAPER I - ORGANIZATION OF CLINICAL MICROBIOLOGY LABORATORY

Duration – 3hrs

Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. Universal precautions state that
   a) Handle only known HBV positive or HIV positive specimens as infectious.
   b) Personal protective equipment is required only for direct patient contact.
   c) Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
   e) All specimens must be labeled with the biohazard symbol.

2. All the following are transport media except,
   a) Stuart's medium
   b) Glycerol saline medium
   c) Cary Blair medium
   d) Thioglycollate broth

3. Infections that may occur as a result of accidental needle sticks or through broken glass is classified as which of the following routes?
   a) Airborne
   b) Ingestion
   c) Direct inoculation
   d) Mucous membrane contact.

4. Needles should not be recapped, bent or broken after use.
   a) True
   b) False

5. Universal precautions apply to all of the following bodily fluids except,
   a) Amniotic fluid
   b) Blood
   c) Semen
   d) CSF

6. Sputum can be liquefied with the following except,
   a) Dithiothreitol
   b) Sputolysin
   c) Sputasol
   d) Lysozyme

7. Chemicals used to disinfect infectious materials are the following except,
   a) 70% ethanol
   b) Sodium hypochlorite
   c) 2% Glutaraldehyde
   d) Chloroform

8. Following media are used for blood culture except,
   a) Brain heart infusion medium
   b) Cooked meat medium
   c) Saponin broth
   d) Selenite F broth

9. A rapid method for the screening of HIV is
   a) Dot – ELISA
   b) ELISA
   c) Western blot
   d) PCR

10. For detection of Mycobacterium tuberculosis, the most sensitive and rapid method is
    a) Culturing on LJ medium
    b) Acid fast staining
    c) Animal susceptibility
    d) Fluorescent Microscopy.

SECTION – B (5X6=30 Marks) - Answer ALL Questions.

11. a) As a health care worker, what would you do differently when handling the blood of someone you think might be infected with HIV as opposed to handling the blood of someone else? (OR)
    b) How will you design a microbiology laboratory for a multispeciality hospital?

12. a) How are most laboratory acquired infections contracted? What action can be taken to prevent laboratory infections. (OR)
    b) How will you handle any mishaps with infective materials in the laboratory.

13. a) When a person comes with a superficial dermatophytic infection, what is the specimen collected and how can it be processed? (OR)
    b) Blood - an ideal specimen for the diagnosis of parasites - Discuss.

14. a) Comment on the different containment levels used in a clinical diagnostic laboratory. (OR)
    b) Comment on the laboratory requisition form.

15. a) Describe the Kirby - Bauer test for antibiotic sensitivity. Why should potential pathogens from patient isolates be tested by this method. (OR)
    b) Name and explain any two rapid detection methods in routine use in a clinical laboratory.
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) List the Universal Precautions.(OR)
b) Describe the procedures used for culturing anaerobic microorganisms.
17. a) Classify infectious biological agents on the basis of hazards. (OR)
b) In a laboratory organization, what are all the steps followed to safeguard laboratory personnel.
18. a) Comment on the biological safety cabinets in a Microbiology laboratory.(OR)
b) How can individual pathogenic viruses be identified in the lab.
19. a) Describe the standard procedure for obtaining and culturing a throat culture and a blood sample. What special precautions must be taken while obtaining the blood culture? (OR)
b) State the special precautions necessary to process a sputum sample suspected for the presence of *Mycobacterium tuberculosis*.
20. a) What are some transport problems associated with stool specimens? Anaerobic cultures? Urine specimens?(OR)
b) Why must the clinical Microbiologist know the reasonable reporting times for various microbial specimens?

DIPLOMA PAPER II - DIAGNOSTIC MICROBIOLOGY I – BACTERIOLOGY AND SEROLOGY

Duration – 3hrs  Maximum – 100 Marks

SECTION A ( 10 x 1= 10 Marks)

Choose the correct answer for each from the FOUR alternatives given

1. The urine sample collected for microbiological analysis should be
   a) First voided urine. b) Mid stream urine  c) Urine form catheter bag  d) Early morning urine sample
2. All the following are acid fast except,
   a) *Mycobacterium*   b) Actinomycetes  c) Nocardia   d) Staphylococci
3. The common medium used for growing *M tuberculosis* is
   a) Blood agar b) Mac conkey agar c) Lowenstein Jensen’s medium d) Robertson’s cooked meat medium
4. An isolate form as urine specimen shows the following biochemical characteristics
   IMViC+++ respectively, Microscopy reveals gram negative bacilli. The most possible Pathogen would be
   a) *E. coli*  b) *Klebsiella pneumoniae*  c) *Proteus vulgaris*  d) *Pseudomonas aeruginosa*
5. Selective medium for *Staphylococci* is a) EMB agar b) BSA c) MSA d) XLD agar
6. In kirby Bauer method, the antibiotic discs are placed at a distance of
   a) 10mm  b) 24mm  c) 28mm  d) 30mm
7. VDLR is an example for
   a) Agglutination  b) Precipitation  c) Complement fixation test  d) Haemagglutination
8. Individuals of blood group type AB
   a) are Rh (D) - negative  b) are “universal recipients” of transfusion  
c) have circulating anti A and B antibodies  d) Have the same haplotype.
9. ELISA can be used to detect
   a) Antigen  b) Antibody  c) Antigen and Antibody  d) None
10. Blotting of DNA is called
    a) Western blot  b) Southern blot  c) Northern blot  d) Dot blot.
SECTION-B (5X6=30Marks) - Answer ALL Questions.

11. a) Describe the procedure involved in collecting sputum sample from a child of age 4 years whose clinical history says “chest congestion for 2 weeks”. (OR)
   b) Explain microscopic examination of urine specimen.

12. a) “Egg Dorset medium” — What type of medium is it? And what pathogen will you cultivate and isolate with the help of the same. (OR)
   b) Name some selective medium used for the isolation of viable pathogens from CSF.

13. a) A pathogen has been isolated from a sputum sample which ferments mannitol. What classical microbiological techniques will you do to identify the causative agent. (OR)
   b) Write the rules to be followed during any microbiological report writing.

14. a) Why does the antibody titre rise after infection? Is a high antibody titre indicative of an ongoing infection? Explain? Why is it necessary to obtain an acute and a convalescent blood sample to monitor infection. (OR)
   b) Describe neutralization reaction with reference to microbial toxins and antisera.

15. a) RIA and ELISA tests are extremely sensitive as compared with agglutination. Why is this case? (OR)
   b) Why is the immunoblot (western blot) procedure used to confirm positive HIV — ELISA results.

SECTION-C (5X12=60Marks) - Answer ALL Questions.

16. a) Name two specimens for which microscopy would be used in initial diagnosis of an infectious disease. Write their collection and transport procedures. (OR)
   b) Name the different microscopic examination procedures used in the identification of a bacterial pathogen in faeces sample.

17. a) How can a clinical microbiological determine the cultivation procedure for a bacterial pathogen from pus sample. (OR)
   b) How will you use a differential medium in the isolation process of a bacterial pathogen from urine sample.

18. a) How can dilution susceptibility test and disk diffusion tests be used to determine microbial drug sensitivity. (OR)
   b) Why must the clinical microbiologist know what are reasonable reporting times for various microbial specimens.

19. a) Agglutination tests are more widely used for clinical diagnostic purposes than precipitation tests. Why is this the case? (OR)
   b) How are fluorescent antibodies used for the diagnosis of viral diseases? What advantages do fluorescent antibodies have over unlabelled antibodies.

20. a) What information is essential for the design of a pathogen specific nucleotide probe?
     Where can one obtain such information? In this information available for all pathogens. (OR)
   b) What are some different ways in which the computers can be used in the clinical microbiological laboratory? What are their major functions for the standpoint of work flow?
DIPLOMA PAPER III - DIAGNOSTIC MICROBIOLOGY II
MYCOLOGY, PARASITOLOGY AND VIROLOGY
Duration – 3hrs Maximum – 100 Marks

SECTION A (10 x 1 = 10 Marks)
Choose the correct answer for each from the FOUR alternatives given
1. Growth medium for fungus inhibits growth of
   a) Bacteria b) Protozoa c) Virus d) helminth
2. Germ tube technique is used to identify
   a) Cryptococcus b) Candida c) Saccharomyces d) Mucor
3. Following are true of Giardiasis except,
   a) Habitat is colon b) Trophozoites and cyst are found in duodenum
c) CFT is diagnostic d) stools contain only cysts.
4. Ingestion of contaminated pork may lead to infections of
   a) Taenia solium b) Taenia saginata c) Taenia corporis d) Taenia pedis
5. Of the following organisms, which has a bigger size?
6. Hookworm infection is by
   a) Ingestion of embryonated eggs b) Larvae penetrating through the skin
   b) Ingestion of larvae c) the bite of insects
7. Viruses can be cultivated in
   a) Nutrient agar b) Cell culture c) Corn meal agar d) Selenite F broth
8. Which of the following is most specific in diagnosis of AIDS?
   a) ELISA b) IHA c) Immunoelectrophoresis d) Selenite F broth
9. The serobiological marker of acute Hepatitis B infection is
   a) HBsAg b) HBsAg + HBcAg c) HBsAg + Core antibody d) HBcAg
10. Viruses are
    a) Found primarily in soil b) Obligate intracellular parasites
    c) Can be cultivated in nutrient agar d) Can be seen in bright field microscope.

SECTION B(5X6=30Marks) - Answer ALL Questions.

11. a) In the 1980’s in a suburban community, a group of residents obtained a court order preventing another resident from feeding the flocks of pigeons that regularly visited the area. Microbiologically was this action justified? Why? (OR)
b) Name the different media used for fungal pathogen isolation and identification.
12. a) Name the techniques used to identify the eggs of parasites in feces. (OR)
b) Add a note on media for parasite isolation.
13. a) Why do most protozoan diseases occur in the tropics. (OR)
b) How do infections caused by Entamoeba histolytica occur?
14. a) Explain why antibiotics are not effective against viral infections. Advise a person about what can be done to relieve symptoms of a viral infections and recover most quickly. (OR)
b) Describe some clinical manifestations caused by the acute respiratory viruses.
15. a) Give two ways by which the presence of viral replication is detected in cell culture. (OR)
b) What are the three main routes of egg inoculation for virus isolation?
SECTION–C(5X12=60Marks) - Answer ALL Questions.

16. a) Comment on Antifungal susceptibility testing.(OR)
   b) Name the specimen collected for dermatophytooses. Is it necessary to store such specimens?
      How will you process them?

17. a) How would you diagnose trichomoniasis in a female? In a male?(OR)
   b) Serodiagnosis of parasitic infections — Comment

18. a) Laboratory identification of blood protozoan — Plasmodium.(OR)
   b) DNA probes — a tool for the diagnosis of helminths — Discuss.

19. a) A patient suspected to be HIV positive, showed positive result for Dot — ELISA at the time of admission. After 3 days a negative result was obtained with ELISA. What test can help you to confirm the diagnosis.(OR)
   b) Describe the specimens collected, the transport media and the laboratory procedures to identify viruses.

20. a) A client has obvious symptoms of hepatitis: yellowing of her skin and eyes, anorexia, abdominal pain and enlarged liver. She had undergone a blood transfusion 3 weeks earlier. Make an accurate diagnosis of the type of hepatitis and identify the causative agent. (OR)
   b) Immunofluorescence — a technique to detect viral infections — Explain.