

Annexure No.	57 A
SCAA Dated	07.06.2007

BHARATHIAR UNIVERSITY :: COIMBATORE – 641 046

**REGULATIONS FOR M. Sc. MICROBIOLOGY DEGREE COURSE WITH
COMPULSORY DIPLOMA IN QUALITY ASSURANCE IN MICROBIOLOGY
with Semester System
(effect from 2007-2008)**

1. Eligibility for Admission to the Course

A candidate who has passed the Degree Examination Microbiology, Zoology, Botany, Biochemistry & Biotechnology as main subject of study of this University or an examination of some other University accepted by the syndicate as equivalent thereto shall be eligible for admission to the Master Degree of this University.

2. Duration of the Course

This Course of Study shall be based on Semester System. This Course shall consist of four Semesters covering a total of two Academic Years. For this purpose, each Academic Year shall be divided into two Semesters; the first and third Semesters; July to November and the second and the fourth Semesters; December to April. The Practical Examinations shall be conducted at the end of even Semester.

3. Course of Study

The Course of the Degree of Master of Science/Arts/Commerce shall be under the Semester System according to the Syllabus to be prescribed from time to time. This Course consists of Core Subjects and Elective Subjects. There shall be one Paper on applied Skill Oriented, subject preferably in each semester as part of the adjunct Diploma Programme.

4. Requirement to appear for the Examinations

- a) A candidate will be permitted to take the University Examination for any Semester, if
 - i) he/she secures not less than 75% of attendance out of the 90 instructional days during the Semester.
- b) A candidate who has secured attendance less than 75% but 65% and above shall be permitted to take the Examination on the recommendation of the Head of the Institution to condone the lack of attendance as well as on the payment of the prescribed fees to the University.
- c) A candidate who has secured attendance less than 65% but 55% and above in any Semester, has to compensate the shortage of attendance in the subsequent Semester besides, earning the required percentage of attendance in that Semester and take the Examination of both the Semester papers together at the end of the latter Semester.

d) A candidate who has secured less than 55% of attendance in any Semester will not be permitted to take the regular Examinations and to continue the study in the subsequent Semester. He/she has to re-do the Course by rejoining the Semester in which the attendance is less than 55%.

e) A candidate who has secured less than 65% of attendance in the final Semester has to compensate his / her attendance shortage in a manner to be decided by the Head of the Department concerned after rejoining the Course.

5. Restriction to take the Examinations

a) Any candidate having arrear paper(s) shall have the option to take the Examinations in any arrear paper(s) along with the subsequent regular Semester papers.

b) Candidates who fail in any of the papers shall pass the paper(s) concerned within 5 years from the date of admission to the said Course. If they fail to do so, they shall take the Examination in the revised Text / Syllabus, if any, prescribed for the immediate next batch of candidates. If there is no change in the Text / Syllabus they shall take the Examination in that paper with the Syllabus in vogue, until there is a change in the Text or Syllabus.

In the event of removal of that paper consequent to the change of Regulations and / or Curriculum after a 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 Regulations/Curriculum for the award of the Degree.

6. The Medium of Instruction and Examinations

The medium of instruction and Examinations shall be in English.

7. Submission of Record Notebooks for Practical Examinations

Candidates taking the Practical Examinations should submit bonafide Record Note Books prescribed for the Practical Examinations. Otherwise the candidates will not be permitted to take the Practical Examinations.

8. The Minimum (Pass) Marks

A candidate shall be declared to have passed in a paper if a student obtains not less than 50% of marks in that paper. A candidate shall be declared to have passed the whole Examination if the student passes in all the papers.

9. Improvement of Marks in the subjects already passed

Candidates desirous of improving the marks secured in their first attempt shall reappear once within the subsequent Semester. The improved marks shall be considered for classification but not for ranking. If there is no improvement there shall not be any change in the original marks already awarded.

10. Classification of successful candidates

A candidate who passes all the Examinations in the first attempt within a period of two years securing 75% and above marks in the aggregated shall be declared to have passed with First Class with Distinction.

Successful candidates passing the P.G. Degree Examinations, securing 60% marks and above shall be declared to have passed the examination in First Class. All other successful candidates shall be declared to have passed the Examination in Second Class.

12. Ranking

A candidate who qualifies for the PG 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 1st or 2nd Class shall be eligible for ranking and such ranking will be confined to 10% of the total number of candidates qualified in that particular subject to a maximum of 10 ranks.

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

13. Conferment of the Degree

No candidate shall be eligible for conferment of the Degree unless he / she has undergone the prescribed Course of Study for a period of not less than four Semesters in an Institution approved of by and affiliated to the University or has been exempted there from in the manner prescribed and has passed the Examinations as have been prescribed.

14. Evening College

The above Regulations shall be applicable for candidates undergoing the respective Courses in the Evening Colleges also.

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.

BHARATHIAR UNIVERSITY , COIMBATORE- 46.**M.Sc. MICROBIOLOGY****(For the students admitted during the academic year 2007 – 08 batch and onwards)****SCHEME OF EXAMINATION**

Sem	Paper	Hrs / week	Hrs of exam	Max marks
I.1	Fundamentals of Microbiology	5	3	100
I.2	Microbial Physiology and Metabolism	5	3	100
I.3	Biochemical Methodology	5	3	100
I.4	Environmental & Agricultural Microbiology	5	3	100
I.5	Food Microbiology	5	3	100
I.	Practical I	5	-	-
II.6.	Molecular Genetics	5	3	100
II.7.	Virology	5	3	100
II.8.	Industrial Microbiology	5	3	100
II.9.	Recombinant DNA Technology	5	3	100
II.10.	Principles of Quality assurance (Diploma I)	5	3	100
II.	Practical II	5	-	-
II	Practical Examination I	-	9	100
II	Practical Examination II	-	9	100
III.11.	Immunology and Immuno-technology	5	3	100
III.12.	Medical Microbiology	5	3	100
III.13.	Biotechnology and IPR	5	3	100
III.14.	Bio statistics & Research Methodology	5	3	100
III.15.	Quality assessment in Food and Pharmaceuticals	5	3	100
	(Diploma II)			
III.	Practical III	5	-	-
IV.16.	Total Quality Management (TQM) (Diploma III)	5	3	100
IV.	Practical Examination III	5	9	100
IV.	Practical Examination (Diploma IV)	5	9	100
IV.	Project and Viva -Voce	-	-	200

* Includes 25% continuous internal assessment marks.

SEMESTER I : PAPER I : FUNDAMENTALS OF MICROBIOLOGY

UNIT I

Basic concepts – Spontaneous generation- Germ theory of diseases – Cell theory – Contributions of Antony van leuwenhoek – Joseph Lister – Robert Koch – Louis Pasteur – Edward Jenner – John Tyndall – Sergei N. Winogradsky – Salmon Awaksman – Alexander Flemming- Paul Erlich – Fannie Hessie – Elie Metchnikoff - Kary Mullis. Development of pure culture methods.

UNIT II

Sterilisation and disinfection – Definitions – Principles – Methods of sterilization -: Physical methods – Heat – Filtration – Radiation and Chemical methods. Control of sterilization and Testing of sterility.

UNIT III

Microscopy – Principles, Light microscope, Phase Contrast, Dark field , Bright field, Fluorescent – Interference microscope (Stereo microscope), Con focal scanning microscope – Inverted microscope - Electron microscope – TEM, SEM. and Micrometry. Staining : Simple, Gram staining, Negative staining, Capsule staining, Spore staining, Flagellar staining, Nuclear staining and Acid fast staining.

UNIT IV

Taxonomy – Principle and its types (Classical approach – Numerical, Chemical, Serological and Genetic). Bacterial taxonomy – Bergey's manual of Systematic Bacteriology (Eubacteria and Archaeobacterium)

UNIT V

Fungal taxonomy – Alexopolus, Algal taxonomy – Classes, Ultra structure and general characteristics. Outline classification of Protozoa – general characters and importance. Economic importance of algae and fungi.

References:

Pelczar. M.J. Jr, E.C.S. Chan Moel: Microbiology Mc Graw Hill Book R Kreig, 1986.

Prescott. L.M. J.P. Harley and C.A. Klein, 2004. Microbiology VI edition.

Atlas R.M. 1997. Principles of Microbiology. II ed. WCB, Mc Graw Hill.

Black,J.G.1999. Microbiology. Principles and explorations, 4th ed, Hall International, inc.

Brook T.D., 1995, Biology of Microorganisms VI ed,

SEMESTER I : PAPER II

MICROBIAL PHYSIOLOGY AND METABOLISM

UNIT I

Microbial cell – Ultra structure of Prokaryotic and Eukaryotic cell. Sub cellular structures and cell envelope, Slime layer, Capsules, Cell wall, Pili, Flagella, Cell - inclusions, Endospores, Cell membrane – Liposomes – Uptake of nutrients by the cell – Facilitated diffusion – Active transport – Group translocation , Iron uptake. Pinocytosis and Phagocytosis.

UNIT II

Microbial nutrition – Nutritional groups, Common nutrient requirements, Growth factors – Microbial growth – Growth curve – Measurement of microbial growth . Growth kinetics – Batch, Continuous and Synchronous cultures. Factors influencing the growth of microorganisms.

UNIT III

Carbohydrate metabolism – EMP, HMP and ED pathway – Kreb's Cycle – Glyoxylate cycle – Aerobic respiration – Substrate level and Oxidative phosphorylation – ATP generation. Lipid catabolism – β -oxidation. Anaerobic respiration – Sulphur compounds – Nitrate and Carbon -di -oxide as electron acceptors. Fermentation.

UNIT IV

Enzymes – Kinetics – Enzyme regulation – Protein structures. Biosynthesis – Aminoacids: Aspartic and serine families. Fatty acid synthesis. Nucleotide biosynthesis.

UNIT V

Autotrophs – Photoautotrophs – Oxygenic and Anoxygenic. Photosynthesis – Assimilation of CO_2 . Chemoautotrophs, Bioluminescence. Archaeobacteria – Adaptations to extreme environments.

References:

Caldwell. D.R. 1995. Microbial Physiology and metabolism, Wm C. Brown Publishers.

Moat. A.G. and Foster. J.W. 1988. Microbial Physiology, John Wiley sons.

White J.D. Motteshead. D.W. Harrison S.J. Environmental system 2 ed. 1992.

Stainier R.Y. Ingraham,J.L. Wheolis, H.H. and Painter. P,R. 1986. Microbiology.

SEMESTER I : PAPER III : BIOCHEMICAL METHODOLOGY

UNIT I

Colorimetry and Spectrometry: Principles, Instrumentation – Beer Lambert's law – Analysis – Qualitative and Quantitative – Uses.

UNIT II

Centrifugation: Principles – Instrumentation – Types – Methods and Applications.

UNIT III

Chromatography: Principles – Types (Paper, TLC, HPLC, GC, Column – Affinity) and Methods – Qualitative and Quantitative – Applications.

UNIT IV

Electrophoresis – Principles, types. Staining and detection methods – Isoelectrophoresis – isoelectric focusing – Applications.

UNIT V

Fundamental building blocks – Atoms – Bonds and molecules. Macromolecules – Chemical nature and functions of Carbohydrate, Lipids, Proteins and Nucleic acids.

References:

Physical Biochemistry: David Freifelder.

Practical Biochemistry, Boyer.

Practical Biochemistry, Keith Wilson and John Walker, 4 ed 1994.

Foundation in Microbiology, Kathleen Talaro and Arthur Talaro, WCB Publishers 1993.

SEMESTER I : PAPER IV

ENVIRONMENTAL AND AGRICULTURAL MICROBIOLOGY

UNIT I

Aerobiology- -Microbial contamination of air – Sources of contamination- Microbial indicators of air pollution. Enumeration of bacteria in air, Air sampling devices. Air sanitation. Effect of Air Pollution on plants and Human.

UNIT II

Soil Microbiology – Structure, types, Physical and Chemical properties – Soil microbes – Soil pollution – Sources. Bio geochemical cycling – Nitrogen, Carbon, Phosphorus, Sulphur, Iron cycles and its importance.

UNIT III

Aquatic microbiology: Microbiology of water – Water pollution and water borne pathogens – Bacteriological examination of water – Indicator organisms. Microbiology of sewage – Waste water treatment – BOD, COD.

UNIT IV

Microbial interaction – Among microbes, with plants, Phyllosphere, rhizosphere. Mycorrhizae – Symbiotic and free living nitrogen fixers – Phosphate solubilizers – Phytopathogens – Bacterial, fungal, Viral diseases. (Wilt, Blight, Chancere, Mosaic) – Control measures.

UNIT V

Recycling of liquid and solid wastes – Composting – Bio gas – Biodegradation. Bioremediation, Bioleaching, Xenobiotic degradation.

References:

Mitchell. R. 1974. Introduction to environmental microbiology.

Atlas R.N. and Bartha. R. 1993. Microbial ecology– Fundamentals and Applications 3 ed.

Campbell. R. 1983. Microbial ecology, 2 ed.

Reiheimer. G. 1991. Aquatic microbiology, 4 ed.

Dart. R.K. and Shettron R.J. 1980. Microbiological aspects of pollution control. 2 ed.

Martin Alexander, 1997. Introduction to Soil Microbiology.

Subbha Rao, M.S. 1995. Soil microorganisms and plant growth.

SEMESTER I : PAPER V : FOOD MICROBIOLOGY

UNIT I

Food as a substrate – Incidence and types of microorganisms in food – Contamination and Spoilage of Meat, Poultry, Sea foods, Vegetables, Fruits.

UNIT II

Principles of food preservations: Asepsis, Preservation by use of High temperature, Low temperature, Canning, Drying, Radiation and Food additives.

UNIT III

Food poisoning – Food borne diseases- Bacterial and Non- Bacterial. Microbial quality and safety – Determining microorganisms in food culture, Microscopy and sampling methods – Chemical and immunological methods.

UNIT IV

Fermented foods – Idli, Bread, Non-bevearagic, Plant based fermented foods – Miso, Ogi, Olives, Pickles, Sauerkraut, Soy sauce, Tempeh. Meat and fishery products – Country cured hams, Dry sausages, Katsuobushi.

UNIT V

Dairy microbiology: Fermented milk products – Butter, Butter milk, Sour cream, Youghurt, Cheese, Kefir, Koumiss, Taette and Tarhama.

References:

James. M. Jay, 1992, Modern food microbiology 4ed.

Frazier, W. C. and Westhoff D.C. 1989. Food Microbiology 8 ed.

Dubey. R.C. and Maheswari. D.K. A Textbook of Microbiology, 1999. 1 ed.

M.Sc., MICROBIOLOGY

SEMESTER II : PAPER I : MOLECULAR GENETICS

UNIT I

Genetics – Historical introduction – Mendelian principles – DNA as a genetic material – Diplex DNA. Chemical composition, Physical structures of DNA, Circular and Superhelical DNA.

UNIT II

DNA replication – Enzymes of replication – Rolling circle model – DNA damage and Repair. Mutation- Spontaneous – Origin of bacterial mutations – Mutagenesis – Spontaneous and Induced mutations – Physical and chemical agents. Mutant selection – Carcinogenicity testing.

UNIT III

Genetic transfers in bacteria – Transformation – Transduction and Conjugation. Linkage and genetic maps. Phage genetics, Phage T mutants, Genetic recombination, Genetic mapping of T-4 Phage .

UNIT IV

Genetic code – Relation between genes and proteins – DNA transcription – RNA translation – Polypeptide synthesis.

UNIT V

Regulation of gene activity – Operon model (Lac, Tryp), Autoregulation – translational regulation.

References:

Freifelder. D. 1995, Molecular Biology

Maloy, S.R. Cronan. J.E. Jr and David Freidfelder, Microbial genetics, 2 ed.

Benjamin Lewin. Genes VII. 1996.

Tamarin. R.H. 1996. Principles of Genetics. 5 ed.

Klug, W.S. and Cummings. M.R. 1996. Essentials of Genetics.

SEMESTER II : PAPER II ; VIROLOGY

UNIT I

History and scope of Virology. Viruses – Definitions – Structures – General properties and Classifications.

UNIT II

Bacterial Viruses – Introduction – taxonomy of bacterial viruses – DNA containing Viruses – Structure – Replication and Growth kinetics of T phages (Lytic and Lysogeny). Filamentous phages – RNA containing viruses – Structure, Replication and growth kinetics of ϕ x 174 .

UNIT III

Plant viruses – RNA viruses, TMV, Cowpea, Mosaic viruses, Bromo mosaic viruses, Satellite viruses. Double stranded DNA viruses – CaM Viruses, Single stranded DNA viruses – Gemini virus.

UNIT IV

Animal viruses – RNA viruses – Picorna virus, Herpes virus, Toga virus. RNA tumor viruses – Retro viruses. DNA viruses – Vaccinia virus, DNA tumor viruses – SV 40, Adeno viruses, emerging viruses, Slow viruses, Prions.

UNIT V

Techniques in virology – Cultivation of viruses – Isolation and Purification of Viruses. Characterization and Enumeration of viruses – Quantitative assay.

References:

Luria. S.E. Darnall. J.E. Baltimore. D. and Compare. A. 1978. General Virology, 3 ed.

Freidfelder ,D. 1995. Microbial genetics.

Grierson. D. and S.Convey, 1989. Plant Molecular Biology, 2 ed.

Hayes. W. 1968. The Genetics of Bacteria and their Viruses.

Mundahar. C.L. 1987. Introduction to plant viruses. 2 ed.

SEMESTER II : PAPER III: INDUSTRIAL MICROBIOLOGY

UNIT I

An introduction on fermentation process – Chronological development – The Range of fermentation process. Component parts of fermentation process. Fermentation economics.

UNIT II

Industrially important microorganisms – isolation, preservation, improvement of strains – handling and development of inoculum for various fermentation process, Upstream processing. Media for industrial fermentation, Formulation and sterilization.

UNIT III

Fermentor design – Body construction – Heat production – Mass transfer – Heat transfer – Stirring and mixing – Newtonian, Non-newtonian fluid. Oxygen transfer – Effect of viscosity- Scale up – Control of temperature, pH and Pressure. Computer applications and fermentor technology.

UNIT IV

Fermentation types and cultures – Submerged and Solid state fermentation – Down stream processing – Recovery and Purification of Intracellular and extracellular products.

UNIT V

Microbial production of organic acids – Aminoacids, Antibiotics, Enzymes and Vitamins. Alcoholic beverages – Wine and Beer. Fermented foods – Bread, Cheese, Soy sauce. Microbial transformations – Steroid and sterols, Non-steroid compounds – Antibiotics and pesticides.

References:

Stanbury P.F.A. Whitaker and S.J. Hall, 1995 Principles of fermentation techniques 2 ed.

Cruegar and Cruegar. A. Textbook of Industrial microbiology 2 ed.

Cassida, J.E. 1968. Industrial microbiology.

Prescott and Dunns, Industrial microbiology.

Peppler. H.J. and D. Pearlmann. 1979. Microbial technology. Vol I & II.

Demain A.L. and Solomon INA, 1986. Manual of industrial microbiology and biotechnology

SEMESTER II: PAPER IV : RECOMBINANT DNA TECHNOLOGY

UNIT I

Gene analysis techniques – Isolation of DNA and RNA – Handling and Quantification of nucleic acids – Radiolabelling of nucleic acids – Gel Electrophoresis – Probing for a specific gene – Southern blotting, Northern blotting. Dot blotting, Western blotting. Chromosome walking – Heteroduplex analysis.

UNIT II

Enzymes – Nucleases: Restriction endonucleases – DNA cloning – Hybrid vectors – Restriction cloning – selection for hybrid vectors – Methods of cloning – Synthesis of cDNA – Cloning from genomic DNA – Genomic libraries – Selection and screening methods.

UNIT III

Biology of genetic engineering – Plasmids used for *E.coli* vectors, based on bacteriophage and M-13 phage vectors. Eukaryotic vectors – Yeast vectors, animal vectors, plant vectors. Prokaryotic and Eukaryotic hosts.

UNIT IV

Restriction mapping : Restriction map construction – Double digest. RFLP – PCR. Site directed mutagenesis, Protein engineering.

UNIT V

DNA sequencing – Dideoxy method, Maxam Gilbert method – Mapping and sequencing the Human genome.

References:

Old ..R. W. and Primrose S.B. 1995. Principles of gene manipulations – An introduction to genetic engineering , 5 ed.

Winnacker E.L, 1987, From Genes to Clones. – Introduction to gene technology.

Nicholl. D.S.T, 1994. An introduction to genetic engineering.

Brown. T.A. 1995. Gene Cloning.

Pinler. A. 1993. Genetic engineering of microorganisms.

M.Sc MICROBIOLOGY

PRACTICAL I

1. Sterilization – Principles and methods.
2. Media preparation – Liquid and Solid media, Agar deep , slant and plate.
3. Pure culture techniques – Streak plate, pour plate, spread plate, decimal dilution.
4. Micrometry – measurement of microorganisms.
5. Motility determination.
6. Enumeration of microorganisms from soil: Bacteria, Fungi and Actinomycetes.
7. Morphology of fungi: Yeast and Algae.
8. Staining: Smear fixation, simple, gram, acid fast, spore, capsule and negative.
9. Growth curve: Direct microscopic (Haemocytometer, Viable count)
10. Effect of various intrinsic factors on the growth of bacterium and fungi – pH, Temperature, Osmotic pressure and nutrients.
11. Anaerobic culture techniques; RCM (*Clostridium* sp). Mc Intosh Fildes anaerobic jar (Total anaerobes) , Wright's tube method.
12. Phenol Co-efficient test.
13. IMViC test
14. Hydrogen sulphite test
15. Oxidase test
16. Catalase test
17. Urease test
18. Nitrate reduction test
19. Polymer degradation – Starch, Gelatin, Casein.
20. Carbohydrate fermentation.

MSc MICROBIOLOGY

PRACTICAL II

1. Wine production
2. Organic acid production – Citric acid – Solid state and Submerged fermentation.
3. Amino acid production – Glutamic acid.
4. Production of Extra cellular enzymes – Protease by submerged fermentation – Cellulose by solid state fermentation.
5. Isolation of nitrogen fixers – free living, symbiotic, ammonification, nitrification, denitrification.
6. Isolation of Phosphate solubilizers.
7. Water quality analysis – MPN.
8. Isolation of Coliphage.
9. Estimation of BOD and COD.
10. Degradation of pesticides and dyes.
11. Isolation of microorganisms from spoiled foods – Meat, milk, Cereals and Bread.
12. Milk quality – Dye reduction test.
13. Thermal death point and thermal death time.
14. Phage titration.
15. TMV transformation
16. Isolation of mutants: Induced - Auxotrophic, Antibiotic resistant and Replica plating technique. Spontaneous - Gradient plate technique.
17. Isolation of Plasmids and chromosomal DNA from microbes.
18. Size determination and fractionation of nucleic acids and proteins – Agarose gel electrophoresis, SDS – PAGE.
19. Gradient Gel electrophoresis.
20. Restriction mapping of γ of Vector DNA.

BHARATHIAR UNIVERSITY , COIMBATORE- 46.

MSc MICROBIOLOGY

COMPULSORY DIPLOMA IN QUALITY ASSURANCE IN MICROBIOLOGY

(For the students admitted during the academic year 2007 – 08 batch and onwards)

SEMESTER II : PAPER I : PRINCIPLES OF QUALITY ASSURANCE

UNIT I

Quality assurance – Introduction and overview – Definition. Designing of microbiology laboratory – Control of quality – Applications.

UNIT II

Quality assessment of Equipments, chemicals, glass wares and laboratory environments – Variance – Quality control calculations – Quality management – Maintenance of records and reports.

UNIT III

Quality assurance in sterilization and disinfection - Preservation of stock cultures, media and diagnostic kits – Quality control of media and stains.

UNIT IV

Quality assessment of disposal – decontaminated matters and other biological effluents – Quality management in transportations of cultures. National control of biologicals – Biological references and standards.

UNIT V

Good laboratory practices – Management of laboratory hazards and knowledge in First aid procedures.

References:

Rajesh Bhatia and Rattan lal Ichhpujani. 1995. I ed. “Quality assurance in Microbiology”

SEMESTER III PAPER XI - IMMUNOLOGY & IMMUNOTECHNOLOGY

UNIT I

Historical background and scope of immunology, Immunohaematology - ABO and Rh factor. Cells and organs of immune system. Non immunological defence mechanism - Barriers, Phagocytosis, inflammation, fever . Types of immunity - HI and CMI.

UNIT - II

Antigens - properties, Epitopes, haptens, adjuvant, cross reactivity. Antibodies - properties, structure (primary & secondary) and isotypes. Diversity and specificity. Anti antibodies.

UNIT - III

Serology - Introduction and classification of antigens and antibody reactions - Agglutination and precipitation reaction. Strength of antigen and antibody bindings - affinity & avidity. Complement pathway and complement fixation reaction. Immunofluorescence RIA, RAST, ELISA and Flowcytometry. Monoclonal antibodies & its applications. (Hybridoma technique)

UNIT - IV

MHC antigens - types and functions. Regulation and response of immune system. Response of B Cell to antigens. T cell products. Immunity to infectious diseases - Viral, bacterial and protozoan . Hyper sensitivity reactions .

UNIT V

Transplantation immunology - Tissue transplantation and grafting . Mechanism of graft acceptance and rejection. HLA typing Tumor immunology. Immunodeficiency diseases and auto immunity. Vaccines - Types and vaccination methods.

REFERENCE :

- Coleman, R.M. , Lourbard, M.F and Sicard, R.E., 1992 Fundamental immunology, 2nd
Kuby, J. 1997 , Immunology, W.H Freeman and co., New York.
Roitt, I.M 1988 Essential of Immunology, Black Well Scientific Publishers.
Tizard , R.I. 1983. Immunology - An introduction , Saunder's College publishers Philadelphia.

SEMESTER III PAPER – XII - MEDICAL MICROBIOLOGY**UNIT I**

Introduction to medical microbiology - Infectious Diseases process – Diagnosis – Process of sample collection, transport and examinations of the specimens. AntibioGram.

UNIT II

Bacteriology: Gram positive organisms - Morphology, cultural characteristics, pathogenicity and laboratory diagnosis of *Staphylococcus aureus*, *Streptococcus pyogenes*, *Pneumococcus*, *Bacillus anthracis*, *Corynebacterium diphtheriae*, *Clostridium welchii*, *Cl. tetani*, *Clostridium botulinum*. *Mycobacteria*, *Spirochaetes* – *Treponema pallidum*, and *Leptospira icterohaemorrhagiae* and Elementary knowledge on *Chlamydiae*, *Rickettsiae* and *Mycoplasma*.

UNIT III

Bacteriology: Gram negative organisms:- Morphology, cultural characteristics, pathogenicity and laboratory diagnosis of *E.coli*, *Klebsiella sp*, *Enterobacter sp*, *Salmonella sp*, *Shigella sp*, *Pseudomonas sp*, *Vibrio cholerae*, *Aeromonas hydrophila*, *Bordetella pertusis*, *Yersinia pestis*, *Bacteroides* and *Neisseria spp*.

UNIT IV

Virology: Basic concepts of virology - General properties of Human viruses, Approaches to viral diagnosis- Serological and Molecular techniques. Pathogenicity and Laboratory diagnosis of viral infections - Hepatitis, Polio, Rabies, Influenza, Measles, Mumps, Rubella, Dengue virus, HIV and Ebola virus.

UNIT V

Mycology : General properties and approaches to laboratory diagnosis. Mycosis –Superficial, Subcutaneous and Systemic infections – Cryptococcosis, Madura mycosis, Histoplasmosis, *Candida albicans*.

Parasitology: Pathogenicity and laboratory diagnosis of *Entamoeba histolytica*, *Taenia solium*, *Plasmodium vivax*, *Wucheraria bancrofti* and *Enterobius vermicularis*. *Trichomonas vaginalis*.

References:

Textbook of Microbiology – Ananthanarayanan and Jayaram Panicker.
Essentials of Diagnostic Microbiology – Lisa Anne Shimeld, Anne T. Rodgers,
Manual of Clinical Microbiology – Lenette, E, Balows H.A.
Textbook of Medical Parasitology – Subash.C.Parija.
Medical Microbiology - Geo. F. Brooks.s
Medical Mycology – Jagadesh Chander.

SEMESTER III PAPER XIII - BIOTECHNOLOGY AND IPR

UNIT I

Microbial synthesis of commercial products: Protein pharmaceuticals: interferons and growth hormones – Antibiotics: novel antibiotics – Biopolymers: gum, melanin, PHB, adhesives- Molecular diagnostic system of genetic disease – PCR/OLA assay

UNIT II

Vaccines – submit vaccines – live recombinant vaccines – attenuated vaccines- vector vaccines- anti idiotypic vaccines – Monoclonal antibodies, Bioremediation and Biomass utilization – Microbial degradation of Xenobiotics – Utilization of starch and sugars, cellulose

Unit III

Plant growth promoting bacteria – N₂ fixation- nitrogenase – Hydrogenase. Nodulation Siderophores – Microbial insecticides - Insecticidal toxin of BT. Mode of action - genetic engineering of B.T. strains – Baculovirus as biocontrol agents.

Unit IV

Transgenic plants and animals – Ti.Plasmid – Derived Vector systems – methods of transferring genetic plants – Developing plant strains by genetic engineering. Insect resistant, virus resistant, herbicide resistant. Transgenic animals methods – The human somatic cell gene therapy – invitro gene therapy – Invivo gene therapy – Antisense therapy.

Unit V

Intellectual Property Rights (IPR)- different types of IPRs, studies on patents granted in India and other countries, special studies on technology evaluation, analyses of patent applications filed in India in various technology areas, international treaties and conventions and patent laws in other countries - Regulating the use of biotechnology – rDNA technology – Food and Agricultural ingredients – patenting Biotechnology invention.

Reference:

1. Glick, B R and J J Pasternak 1994. Molecular biotechnology – Principles and applications of recombinant DNA. ASM press Washington D.C.
2. Winnacker E.L. 1987 from Genes to Clones – Introduction to Gene Technology. VCH Weinherm
3. Old R W and Primrose S B 1995 Principles of Gene Manipulation - An introduction to genetic engineering. 5th edition Blackwell scientific publications London.
4. Intellectual Property Rights (IPR) bulletin
5. http://www.indianembassy.org/policy/ipr/ipr_2000.htm

SEMESTER III PAPER XIV - BIOSTATISTICS AND RESEARCH METHODOLOGY

UNIT I

Defenition – Scope of Biostatistics,Probability analysis ,Variables in Biology- Collection,Classification and Tabulation of data.Graphical and diagrammatical representation – Scale diagram-Histogram- frequency curve.

UNIT II

Measures of central tendency- Arithmetic mean , Median,Mode.Calulation of Mean,median,Mode in series of individual observatios,discrete series,continous, open end classes,measure of dispersion,standard deviation,standard error.

UNIT III

Simple correlation coeffecient of correlate regression- simple and linear regression.

UNIT IV

Basic ideas of significant test-Hypothesis testing,Level of significant test,test based on studies-t-test- chi square , Goodness of fit.

UNIT V

Problem selection and project designing. Review of literature, source of collection, processing of data, presentation of data, error, editing the final draft, presentation of research project.

REFERENCES:

- 1.S.P.Guptha-Statistical Methods
- 2.Palanisamy and Manoharan-Statistical methods of Biology
- 3.Khan and Khan- Fundamentals of Biostatistics
- 4.Kothari-Research Methodology

SEMESTER III – PAPER XV
QUALITY ASSESSMENT IN FOOD AND PHARMACEUTICALS

UNIT I

In house Committee for quality assurance, Persons involved, Internal Microbial Quality control Policy, Quality Check at every step from collection of raw materials till it reaches the customer , Implementation of ISO standards and history, definitions, principles and use of HACCP in Food Industry .

UNIT II**Methods for the microbiological examination of foods:**

Indicator organisms – Direct examination – culture techniques – enumeration methods – plate – Viable & Total Count; Alternative methods – Dye reduction tests , electrical methods , ATP determination: Rapid methods, immunological methods – DNA / RNA methodology – Laboratory accreditation.

UNIT III**Food laws and regulations**

- A. National – PFA Essential Commodities Act (FPO, MPO etc.)
- B. International – Codex Alimentarius, ISO – 9000 series , ISO 22000 & BS 5750.
- C. Regulatory Agencies – WTO

Consumer Protection Act - Relevance of Microbiological standards & criteria for food safety – Sampling plans – Microbiological guidelines

Hygiene and sanitation in food sector

- A. General Principles of Food Hygiene,
- B. Food sanitary quality – Coli form bacteria as Indicator, *Enterococci* and other indicators.
- C. GHP for commodities, equipment, work area and personnel
- D. Cleaning and disinfection (Methods and agents commonly used in the hospitality industry)
- E. Safety aspects of processing water (uses & standards)
- F. Waste Water & Waste disposal

UNIT IV**Microbial Quality Control of Water;**

Quality of flowing waters (According to Water study group of German Federal States) – Criteria for Assessment – Microorganisms in Water – Indicator germs – Detection of coli form bacteria – Biological toxic tests – Quality control – WHO guide lines for water quality control .

UNIT V**Microbiological spoilage and preservation of pharmaceutical products;**

Types of spoilage, Factors affecting microbial spoilage – assessment of microbial spoilage – preservation. Ecology of microorganisms as it affects the pharmaceutical industry – Sterile pharmaceutical products – injections, Non injectable sterile fluids, Ophthalmic preparations, dressings & implants.- Sterilization control- methods of sterility testing- sterilization monitors and Quality assurance of products . The microbiological quality and

regulatory requirements for natural and nutraceutical products, The regulatory control and quality assurance of immunological products, Containment system integrity – sterile products, Regulatory guidelines (microbiology) for veterinary antimicrobial products.

The role of the Qualified Person in microbiological quality assurance, Safety in microbiology, Rapid enumeration and identification methods, Selection and use of cleaning and disinfection agents in pharmaceutical manufacturing, Prevention and elimination of microbial biofilms in the manufacturing environment using Clean-in-Place, Cleanroom design, operation and regulatory standards, microbiological quality assurance Validation of aseptic processing and media fills, International disinfectant testing protocols, Measurement of biocide effectiveness, Microbiological quality and regulatory requirements for biotherapeutics and manufactured products, The role of the microbiologist in HACCP, Auditing the pharmaceutical microbiology department.

Reference ;

1. Food Microbiology – Frazier and D.C.Westhoff, Third Ed, TATA McGra Hill Pub. New Delhi.
2. Pharmaceutical Microbiology – W.B.Hugo & A.D.Russel, 4 th Ed, Blackwell Scientific Publications.
3. INDUSTRIAL PHARMACEUTICAL MICROBIOLOGY - I:
Standards & Controls
Editors – Dr Norman Hodges and Professor Geoff Hanlon (University of Brighton)
4. INDUSTRIAL PHARMACEUTICAL MICROBIOLOGY- II:
Standards & Controls
Editors – Dr Norman Hodges and Professor Geoff Hanlon (University of Brighton)
(REF ; www.euromed.uk.com)
5. Water Analysis – A practical guide to Physico – Chemical & Microbiological water examination and Quality assurance – W.Schneider, W.Fresenius & K.E. Quentin .
Springer – Verlag Pub. Heidelberg.
6. Modern Food Microbiology – 3 rd Ed. James. M . Jay , Published by Van Nostrand Reinhold , New York.
7. Food Microbiology. 2 nd Edition – M.R.Adams & M.O.Moss – Panima Publishing Corporation , New Delhi, Bangalore

MSc MICROBIOLOGY PRACTICAL III

1. Diagnostic microbiology
Isolation and interpretation of clinical specimens from the following systems: –
Respiratory tract, Gastrointestinal tract, Urinary tract, Skin infections, Circulatory system, Central nervous system and from organs like eye, ear and nose.
Tuberculosis and anaerobic infections.

2. Isolation and identification of clinically important fungi- *Candida albicans*, *Aspergillus sp*, *Cryptococcus neoformans*.
3. Antibiotic susceptibility test.- Kirby bauer technique
4. Identification and enumeration of Lymphocytes.
5. Examination of blood smear study for *Plasmodium sp*
6. Isolation and characterization of antigens
7. Development of polyclonal antibodies
8. Purification of immunoglobulins and their sub units.
9. Serological tests: Blood grouping, Widal, VDRL, RA, ASO, CRP, ELISA
10. Immunoelectrophoresis
11. Ouchterlony's immunodiffusion
12. Separation techniques: Chromatography- Paper. TLC Column.
13. Sterility testing
14. Virus cultivation – Egg inoculation.

SEMESTER IV - PAPER – XVI -TOTAL QUALITY MANAGEMENT (TQM)

UNIT – I

Concepts in TQM- Tools & techniques of TQM – Requirements for implementing TQM – Steps for implementing TQM – Questionnaire, Assessment through questionnaire – Mission statement – Benefits of TQM – Check list for implementing TQM – Case study.

UNIT -II

Types of Data , tabular and **Graphical summarization of numeric data** : - Histograms & Stem and Leaf displays : **Graphs for categorical data** – Bar, Pie charts & Pareto diagrams.

UNIT – III

Graphs for time ordered data – Run charts , Cause effect diagrams – Check Sheets

UNIT –IV

Numeric data summarization - The mean, mode & Median ; The Standard deviation , Variance , Range & Percentiles.

UNIT -V

Graphic display of numeric summaries:-The box plot and the scatter diagram .
Skewness, T – test, Anova,

Reference:

1. Twelve Management skills for success – Ram Narain , Viva books private limited – Chennai.
2. A cross functional perspective Total Quality Management – Rao, Carr, Dambolena and Kopp- John Wiley & Sons, New York .

DIPLOMA IN QUALITY ASSURANCE IN MICROBIOLOGY- PRACTICAL

1. Microbiological laboratory safety- General rules & Regulations.
2. Staining Techniques (Grams and LPCB)–Food samples- vegetables and packed foods.
3. Sterility tests for Instruments – Autoclave & Hot Air Oven
4. Disinfection of selected instruments & Equipments
5. Sterility of Air and its relationship to Laboratory & Hospital sepsis.
6. Sterility testing of Microbiological media
7. Sterility testing of Pharmaceutical products –Antibiotics, Vaccines & fluids
8. Standard qualitative analysis of water.
9. Quantitative analysis of water – Membrane filter method
10. Analysis of food samples for Mycotoxins (Afla toxins)
11. Enumeration of microbes from industrial effluents.
12. Evaluation of Drug potency by MIC.
13. Isolation & characterization of Bacteria from wood and Paints.
14. Assay of microorganisms from biomedical waste.

Reference

- Microbiology - A laboratory manual, Cappuccino & Sherman , 6 th Ed, Pearson Education
- Manual of diagnostic microbiology, Dr.B.J.Wadher & Dr.G.L.Bhoosreddy, First .Ed ., Himalaya publishing house, Nagpur.
- Pharmaceutical Microbiology – W.B. Hugo
- Pharmaceutical Microbiology – Purohit
- Laboratory Exercises in Microbiology, George.A.Wistreich & Max.D.Lechtman, 3 rd Ed, Glencoe press, London.

IMMUNOLOGY & IMMUNOTECHNOLOGY
SECTION -“A (10x1=10)

1. Erythroblastosis foetals is related to the blood group -----
a) ABO b) MN c) Rh d) all
2. Passing of antibody from mother to foetus -----
a) Natural passive immunity b) Natural active immunity c) Artificial passive immunity d) Artificial active immunity
3. Chemical Structure of antibody was found by -----
4. On HAT medium -----cells can grow
5. RIA was first developed by -----
6. In Ouchталony technique -----moves
a) Antigen b) Antibody c) Both d) None
7. HLA complex encode by -----genes
8. Hyper sensitivity reaction was classified by -----
9. An adjuvant which contains a suspension of killed tubercle bacilli is called -----
10. Vaccs means -----

SECTION “B (5x5=25)

11. a) Discuss the contributions of Edward Jenner in the field of immunology (OR)
11. b) Differentiates between CMI and HI
- 12 a) Mention the structure and function of Ig M. (Or)
- 12 b) Discuss the feature of Antigens
- 13 a) Discuss about the function and clinical application of Flow cytometry (Or)
- 13 b) Draw a flow chart for the classical pathway of complement
- 14 a) Write a brief account on B cell response to antigen (OR)
- 14 b) Explain the T cell mediated Hyper sensitivity reaction.
- 15a) Write notes on any two anti inflammatory disorder (OR)
- 15 b) Explain the factors favoring graft survival.

SECTION “C (5x8=40)

- 16 a) What is phagocytosis? How it is helpful in immune system? Explain in detail (OR)
- 16 b) Explain the structure and function of thymus.

17 a) Describe the properties and functions of iso antibodies (OR)

17 B) Write short notes on

1. Haptens
2. Anti antibody
3. Idiotype & 4. Ig D

18 a) What is the principal and clinical applications of ELISA (OR)

18 b) Describe the Hybridoma technique and its applications

19 a) Differentiate primary and secondary response of immune system (OR)

19 b) Discuss about the principle and clinical features of hyper sensitivity reaction II & III

20 a) Discuss the classes and significance of MHC molecules (OR)

20 b) What is transplantation? Discuss the mechanism of allograft rejection.

MEDICAL MICROBIOLOGY

Time : 3 hours

Max.marks: 75 marks

Section – A. (10x1=10 marks)s

Answer all questions

1. The ability of a microbe to cause disease depends upon the host's:

- | | |
|--------------------|-----------------------|
| a. Genetic makeup | b. Nutritional status |
| c. Level of stress | d. All of the above. |

2. Infections acquired from the hospital environments are referred as:

- | | |
|-------------------------|-------------------------|
| a. Droplet infection | b. Nosocomial infection |
| c. Congenital infection | d. Secondary infection. |

3. Toxic shock syndrome is caused by

- | | |
|-----------------------------------|------------------------------------|
| a. <i>Staphylococcus albus</i> | b. <i>Streptococcus pyogenes</i> |
| c. <i>Staphylococcus pyogenes</i> | d. <i>Streptococcus pneumoniae</i> |

4. A form of anthrax characterized by a malignant pustule is:

- | | |
|-----------------------|--------------------------|
| a. Intestinal anthrax | b. Wool sorter's disease |
| c. Cutaneous anthrax | d. emetic form |

5. The term used to denote the club-shaped bacillus or an irregularly shaped gram positive rods is:
- | | |
|---------------|-------------------|
| a. Coryneform | b. Polymorph |
| c. Coccoid | d. Gram positive. |
6. A common nosocomial pathogen known to cause Blue pus infection is:
- | | |
|--------------------------|--------------------------------|
| a. <i>Proteus sp</i> | b. <i>Enterobacter cloacae</i> |
| c. <i>Pseudomonas sp</i> | d. <i>E.coli</i> |
7. TCBS is a selective media for the isolation of:
- | | |
|---------------------------|-------------------------|
| a. <i>Vibrio cholerae</i> | b. <i>Salmonella sp</i> |
| c. <i>Aeromonas sp</i> | d. <i>Proteus sp</i> |
8. The best temperature used for long-term storage of viruses is:
- | | |
|-----------------------|------------------------|
| a. RT | b. 4 ⁰ C |
| c. -20 ⁰ C | d. -168 ⁰ C |
9. Which of the following species produce the germ tube.
- | | |
|--------------------------------|-----------------------------|
| a. <i>Geotrichum candidium</i> | b. <i>Candida albicans</i> |
| c. <i>Candida glabrata</i> | d. <i>Rhodotorula rubra</i> |
10. Trophozoites and cysts can be appropriately stained by using:
- | | |
|--------------------------|--------------------|
| a. Trichrome staining | b. Giemsa staining |
| c. Modified AFB staining | d. Gram staining. |

Section B (5x5=25 marks)

Answer all the questions

11. a. Explain the Koch's Postulates.
(OR)
b. Define an Infection. Give the sources and mode of transmission.
12. a. Give the Colony morphology of *Staphylococcus aureus*
(OR)
b. Describe the pathogenicity of *Bacillus anthracis*,
13. a. Explain the serological test done to diagnosis typhoid.
(OR)
b. How will you diagnosis syphilis?
14. a. List out the general properties of Virus along with the method of cultivation.
(OR)
b. Write notes on Mumps.
15. a. Explain the process of microscopical diagnosis of fungal specimen.

(OR)

- b. With a neat sketch explain the structure of trophozoite seen in *E.histolytica*.

SECTION C (5X8 =40 MARKS)

Answer all the questions

16. a. Explain the disease cycle.

(OR)

- b. Comment on the sample collection and transport for microbiological diagnosis.

17. a. Give the pathogenicity and lab diagnosis of Diphtheria bacillus.

(OR)

- b. Give the pathogenicity and lab diagnosis of tetanus infection..

- 18 a. Describe the disease condition of an acute diarrhoeal infection along with its laboratory diagnosis..

(OR)

- b. How will you diagnose typhoid infection caused by *S. typhi* ?

19. a. Give an example of Rhabdo virus and explain its pathogenicity and laboratory diagnosis.

(OR)

- b. Explain the procedures for the diagnosis of Viral Hepatitis.

20. a. Candidiosis- explain its pathogenicity and laboratory diagnosis.

(OR)

- b. How will you confirm a patient to have a haemoparasitic infection?. Explain the Life cycle of *Plasmodium sp.*

BIOTECHNOLOGY

Duration : 3 hours

Maximum : 75 Marks

SECTION – A Answer ALL questions

(10 x 1 = 10 Marks)

1. Define the use of growth hormones
2. Name the biopolymers and its uses
3. What is anti idioptope?
4. Define Xenobiotics
5. Siderophore- define
6. Nif gene and its role.
7. What is shuttle vector?
8. Differentiate *invivo* from *invitro*
9. What is IPR?
10. Mention any two patent agencies

SECTION – B **Answer ALL questions** **(5 x 5 = 25 Marks)**

- 1.a) What are the importances of engineered *Xanthomonas campestris*.
(or)
1.b) How will you produce the novel antibiotics? Brief the steps.
- 2.a) rDNA technology is very much useful in vaccine production- How?
(or)
2.b) describe briefly the utilization of starch
- 3.a) Hydrogenase- explain.
(or)
3.b) List out the plant growth promoting bacteria and its importance.
- 4.a) How will you prepare the transgenic sheep?
(or)
4.b) Write a detail account on use of transgenic animals.
- 5.a) Explain the IPR procedures briefly.
(or)
5.b) write a note on regulation of food and ingredients.

SECTION – C **Answer ALL questions** **(5 x 8 = 40 Marks)**

- 6.a) List out the pharmaceutical proteins and its disorders.
(or)
6.b) What do you mean by ‘genetic complementation’? Explain the engineering of polymer.
- 7.a) 7.a) Write notes on vector vaccine.
(or)
7.b) Describe the preparation of monoclonal antibodies add its therapeutic values.
- 8.a) Describe the preparation of genetically engineered *B.thuringiensis* strains.
(or)
8.b) Explain the use and engineering of the embryonic stem cell method.
- 9.a) Write a note on transgenic cattle.
(or)
9.b) How will you differentiate the DNA microinjection and retro viral method of gene transfer
- 10.a) What are the rules to be followed for the patenting of engineered organisms.
(or)

10.b) Brief the regulation of rDNA technology.

BIOSTATISTICS AND RESEARCH METHODOLOGY

SECTION – A (10X1=10) ANSWER ALL QUESTIONS

- 1.Primary data
2. Frequency polygon
3. Calculate median of the following 5,7,9,3,8,6,2
- 4.Mode
- 5.Positive Correlation
- 6.Simple regression
- 7.Nul hypothesis
- 8.Review of Literature
- 10.Bibliography

SECTION B (5x5=25) ANSWER ALL QUESTIONS

11a) Draw a histogram for the following data

	X	0-10	10-20	20-30	30 -40	40-50	50-60	
	Y	5	8	12	15	9	4	OR

11b) What are the characteristics feature of the table – Describe

12 a) Calculate the simple arithmatic mean for thr following

	X	15	20	25	30	35	
	Y	2	5	3	4	2	OR

12 b) Define mode.What are the advantages and limitations of mode.

13 a) What is correlation coefficient. Describe. OR

13 b) What is linear regression ?

14.a) Any one problem may be given in unit 4 . OR

14 b) What is hypothesis testing. Describe.

15.a) How is data processed. Describe OR

15 b) How is problem for research decided. Describe

SECTION C (5x8=40) ANSWER ALL QUESTIONS

16 a) Write a descripture account of collection and classification of data. OR

16 b) In an experiment the generation time of 100 strains of bacteria was estimated and the results are given as follows

GT	20- 30	30-40	40-50	50-60	60-70	70-80	
No of strain	32	15	25	14	7	7	Draw a pie diagram

17a) What are the various methods of dispersion. State the advantages and disadvantages of each measure OR

17b) Any one problem in standard deviation

18a) Any one problem for the calculation of linear regression OR

18b) Any one problem for correlation regression

19a) and 19b) Problem may be given in Unit 4

20a) What is review of literature. Describe the methods and significance of literature review. OR

20b) Describe the various steps involved in project designing and final submission of the project report.

DIPLOMA EXAMINATION

Microbial Quality management in Food and Pharmaceutical Industries

Time : 3 Hours

Maximum : 75 marks

SECTION A – (10 * 1 = 10 marks)

Answer ALL questions

All questions carry equal marks

1. Name the recent ISO standardization series for food industries
2. Define - HACCP
3. What is an indicator organism
4. Give an example of a dye used in the detection of food quality.
5. List any two roles of regulatory agencies.
6. Comment - Food Hygiene.
7. What are the characters of a coli form.
8. How the biofilms are formed in pharmaceutical products
9. Comment on Gamma irradiation.
10. Add a note on biocide.

SECTION B – (5 * 5 = 25 marks)

All questions carry equal marks. Choose either (a) or (b).

11. a. Discuss the role of “In house Committee for quality assurance” (or)
b. Explain the principle and use of HACCP in Food Industry .
12. a. Check the quality of milk by “ Methylene blue reduction test” (or)
b. Discuss the need for Laboratory accreditation in food industry.

13. a. Add a note on ISO 22000 with reference to food industry (or)
b. Give an outline of general principles of food hygiene
14. a. Discuss the quality of flowing waters (or)
b. Comment on WHO guide lines for water quality control.
15. a. List out the sterilization monitors and Quality assurance of pharmaceutical products (or)
b. Briefly discuss on microbiological quality and regulatory requirements for biotherapeutics.

SECTION C – (5 * 8 = 40 marks)

All questions carry equal marks. Choose either (a) or (b).

16. a. Explain the Internal Microbial Quality control Policy. (or)
b. Discuss the need to implement ISO standards in industries.
17. a. Explain on Indicator organisms in food and how will you identify them. (or)
b. Give a detailed account on electrical & immunological methods for microbial examination of food.
18. a. Add a short notes on :
(1). International – Codex Alimentarius, (2) ISO – 9000 series , (3) ISO 22000 & (4) BS 5750. (or)
b. Give a detailed account on GHP for commodities, equipment, work area and personnel .
19. a. Determine the quality of drinking water. (or)
b. Critically comment on various biological toxic tests performed for water.
20. a. Discuss in detail on regulatory control and quality assurance of immunological products (or)
b. Explain the role of the microbiologist in HACCP & Auditing the pharmaceutical microbiology department.

DIPLOMA EXAMINATION
Total Quality management (TQM)

Time : 3 Hours

Maximum : 75 marks

SECTION A – (10 * 1 = 10 marks)

Answer ALL questions

All questions carry equal marks

1. Define – Total Quality Management
2. What is a Questionnaire
3. What is a quantitative data
4. Name any one technique of exploratory data analysis.
5. How the paired bar charts are helpful in comparing two different populations.
6. Reason out – Graphs carry much more impact than tables.
7. What is a flow chart?
8. List any two advantages of cause and effect diagrams
9. Give the formulae for calculating standard deviation.
10. Comment on primary data.

SECTION B – (5 * 5 = 25 marks)

All questions carry equal marks. Choose either (a) or (b).

11. a. What are the concepts involved in TQM (or)
b. State the various requirements for implementing TQM.
12. a. Comment on “ Fool proofing” (or)
b. Add a note on types of data.
13. a. Discuss the need for data summarization (or)
b. Comment on frequency distributions
14. a. Express the following data in a Pie chart (distribution of cheese pockets in various cities, Coimbatore -48, Salem-34, Erode- 13 & Trichy-05) (or)
b. Sketch a flow chart on quality check in wine production.
15. a. List out the benefits of scattered diagrams (or)
b. What is a Box Plot , comment on it's use.

SECTION C – (5 * 8 = 40 marks)

All questions carry equal marks. Choose either (a) or (b).

16. a. What are the tools used to access the quality. (or)
b. What is a questionnaire? Frame a questionnaire to assess the quality of Amul cheese.
17. a. Explain on TQM and its benefits . (or)
b. Give a detailed account on different types of data.
18. a. Explain the tools used to express the summarized numeric data in graphical form (or)

b. The survey report of Ministry of Health, for the number of persons affected by food allergies in Tamilnadu in various periods are given below. Express them through a bar diagram .

YEAR	1985	1990	1995	2000
No. Of Persons	204	156	125	68

19. a. Discuss on Run charts & Cause effect diagrams. (or)

b. Critically comment on Check sheet & define its uses .

20. a. Calculate Mean, Median and Standard Deviation for the following data

X	0 – 10	10 -20	20 -30	30 -40	40 -50	50 -60
Y	6	13	29	26	17	9

(or)

b. How the T-test used to compare the sample mean with the population mean, explain with an example.