

<b>Annexure No.</b>	<b>43 A</b>
<b>SCAA Dated</b>	<b>29.02.2008</b>

**BHARATHIAR UNIVERSITY COIMBATORE – 641 046**

**REGULATIONS FOR B.Sc. BIOTECHNOLOGY DEGREE COURSE WITH  
COMPULSORY DIPLOMA IN MEDICAL BIOTECHNOLOGY**

With semester system  
(With effect from 2007 – 2008)

**1. Eligibility for admission to the course**

Candidate for admission to the first year **B.Sc. Biotechnology** degree course shall be required to have passed the higher secondary examination with one of the subjects as Biology or Zoology/Botany (academic) conducted by the Govt. of Tamilnadu in the relevant subjects or other examinations accepted as equivalent there to by the syndicate, subject to such other conditions as may be prescribed therefore.

**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, for the practicals at the end of the academic year

**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)

1. 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.

2. The foundation course B shall comprise of only one paper which shall have environmental studies.

**a. 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 – two subjects – four papers

Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C:** application oriented subjects: Two subjects – Four 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 training in the biotechnology industry, related to the application –oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3<sup>rd</sup> year and submit a training report based on his/her training. 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 fieldwork/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 and VI semesters.

**e) Co-curricular activities: NSS/NCC/Physical education:**

Each student shall participate compulsorily for the 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 (4<sup>th</sup> or 5<sup>th</sup> or 6<sup>th</sup> 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. Restriction 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 the paper with the syllabus in the 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 part 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 book 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 and practical) in the University examination shall be declared to have passed in the subject (theory and 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 subject of subsequent two semesters. The improved marks shall be considered for the 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 II 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 Distinction**

b) (i) A candidate who passes all the examination in Part I or Part II or Part III or Diploma securing not less than 60% of total marks for concerned Part shall be declared to have passed in **Fist Class**

(ii) A candidate who passed all the examination in Part I or Part II or Part III or Diploma securing not less than 50% but below 60% of total marks for concerned Part shall be declared to have passed 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 examination as have been prescribed therefore.

- ii. Has satisfactorily participates in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principle of the Institution.
- iii. Has successfully completed the prescribed Field Work/ Industrial 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 from 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 II alone by granting exemption from appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidate should obtain exemption from the University by paying a fee of Rs 500/-.

### **14. Evening College**

The above regulations shall be applicable for candidates under going the respective courses in evening Colleges also.

### **15. 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.

### **16. Transitory provision**

Candidates who have undergone the course of study prior to the academic year 2007-2008 will be permitted to take the Examination under those regulations for a period of four years i.e., up to and inclusive of April 2012. Thereafter they will be permitted to take the Examination only under the regulations in force at that time.

**SCHEME OF EXAMINATION FOR B. Sc. BIOTECHNOLOGY**

Sem	part	Subject & paper	Instructional hours / week	University examination	
				Dura- tion	Max marks
<b>I</b>	I	Language paper I	6	3	100
	II	English paper I	6	3	100
	III	Gr. A .Core paper I Cell biology	4	3	100
		Gr. A .Core Paper II Biodiversity	4	3	100
		Gr. B. Allied A paper I Chemistry	4	3	75
		Core practical I	2	-	-
		Allied Practical	2	-	-
	FC	FCA	2	-	-
<b>II</b>	I	Language paper I	6	3	100
	II	English paper I	6	3	100
	III	Gr. A. Core paper III Biochemistry	5	3	100
		Core Practical I (cell Biology & biochemistry)	4	3	100
		Gr B Allied Paper II chemistry	4	3	75
		Allied practical	3	3	50
	FC	Foundation course A	2	3	100
<b>III</b>	I	Language Paper III	6	3	100
	II	English Paper III	6	3	100
	III	Core Paper IV Microbiology	4	3	100
		Core Paper V Genetics	4	3	100
		Gr B Allied B Paper III Basic Mathematics	4	3	75
		Practical II (Microbiology & Genetics)	2	-	-
		FCB	1	-	-
		Diploma Paper I Human physiology	3	3	100
<b>IV</b>	I	Language Paper IV	6	3	100
	II	English Paper IV	6	3	100
	III	Gr A Core Paper VI Bioinformatics	4	3	100
		Practical II (Microbiology & Genetics)	4	3	100
		Gr B Allied B paper II (Computer applications)	4	3	75
		Allied Practical II	2	3	50
	FC	Foundation course B	1	3	100
		Diploma Paper II Human pathology	3	3	100

<b>V</b>	<b>III</b>	Gr A Core paper VII Immunology	4	3	100
		Core Paper VIII Plant Biotechnology	4	3	100
		Core Paper IX Animal Biotechnology	4	3	100
		Core Practical III Applied Biotechnology	3	-	-
		AOS practical IV:Lab in immunology and rDNA technology	4	-	-
		Gr C (Application oriented subject A) Paper I Molecular Genetics	4	3	75
		Gr C (Application oriented subject A) Paper II Biology of cloning Vectors	4	3	75
		Diploma Paper III Diagnostic tools	3	3	100
<b>VI</b>	<b>III</b>	Gr A Core Paper X Microbial Biotechnology	5	3	100
		Core Paper XI Environmental Biotechnology	5	3	100
		Core Practical III applied biotechnology	4	6	100
		AOS practical IV:Lab in immunology and rDNA technology	5	6	100
		Gr C (Application oriented subject B ) Paper I rDNA technology & Bioethics	4	3	75
		Gr C (Application oriented subject B ) Paper II Biophysics & Bioinstrumentation	4	3	75
		Diploma Paper IV Pharmacology	3	3	100

### COMPULSORY DIPLOMA IN MEDICAL BIOTECHNOLOGY

Paper I	HUMAN PHYSIOLOGY	3	100
Paper II	HUMAN PATHOLOGY	3	100
Paper III	DIAGNOSTIC TOOLS	3	100
Paper IV	PHARMACOLOGY	3	100

## CORE PAPER: I

### Subject Title: CELL BIOLOGY

**Subject description:** This course presents the types and structural details of the basic unit by which all the living things are made of (the cell).

**Goals:** To make the student to understand the concept of cell and their activities.

**Objectives:** On successful completion the subject student should have understand: Structural features, Organelles and the cellular mechanisms.

#### UNIT I

Cell as a basic unit: discovery of the cells, classification of cell types, development of cell theory, early chemical investigation in cell biology. Prokaryotic and Eukaryotic cell organization.

#### UNIT II

Cell transport phenomenon: membrane architecture. Active, Passive, diffusion and osmosis. Chemistry of carbohydrates, lipids, proteins and nucleic acids.

#### UNIT III

Structure and function of cytoplasmic compartments of the cell: ribosome and protein synthesis, energy flow through mitochondrion, chloroplast and photosynthesis, Golgi apparatus, lysozymes and micro bodies, endoplasmic reticulum, cytoskeleton, vacuoles, peroxysomes, lysosomes and Nuclear compartment. Heterochromatin and euchromatin, polytene chromosomes.

#### UNIT IV

Cell division in prokaryotes and eukaryotes: Cell cycle, mitosis, meiosis, crossing over and characteristics of cancer. Apoptosis, Stem cell. Prions.

#### UNIT V

Integrative and specialized cellular events, cell-cell signaling, specialized cells nerve cells, sperm cells, microfilaments, microtubules, muscle cells. Cells of vision, Nucleo-cytoplasmic interaction, cell cloning.

#### References

1. Cell and molecular biology, 3<sup>rd</sup> edition, Philip Sheeler, Donal E Bianchi, John Wiley
2. Molecular biology of cell, Alberts et al
3. Molecular cell biology, Lodish, Baltimore, Scientific American books, 1994
4. Molecular and cell biology, Stephen L Wolfe, Wordsworth Publishing company 1993
5. Cell biology. Sadava
6. Cell and Molecular Biology De Roberties



## **CORE PAPER: II**

**Subject Title: BIODIVERSITY**

**Subject description:** This course presents the Divers nature of the organisms

**Goals:** To make the student to understand the diversity of the nature

**Objectives:** On successful completion the subject student should have understand:  
Species and genius on the earth, conservation and development of biological resources.

### UNIT-I

General aspects of biodiversity-General introduction. Types of Biodiversity-Global biodiversity, biodiversity in India-Species biodiversity, Measures of biodiversity-Loss of biodiversity. Listing of threatened biodiversity-threatened animals, Plants, causes for the loss of biodiversity. Biodiversity-strategy and action plan.

### UNIT II

Species concept; biological nomenclature. Theories of biological classification; structural, biochemical and molecular systematic. DNA fingerprinting, numerical taxonomy, magnitude and distribution of biodiversity, economic value, wild life biology,.

### UNIT III

Broad outlines of classification and evolutionary trends among algae, fungi, bryophytes and terydophytes. Economic importance of algae, fungi and lichens. Biotic community-concept, structure, dominance, fluctuation and succession; N,P,C,S cycles in nature Principles of conservation, conservation strategy and sustainable development.

### UNIT IV

Interaction between environment and biota; concept of habitat and ecological niches, limiting factor, energy flow, food chain, food web and tropic levels, ecological pyramids and recycling.. Ecosystem dynamics and management, stability and complexity of ecosystem, speciation and extinctions, environmental impact assessment.

### UNIT V

Physiochemical properties of water, distribution and impact of experimental factors on the aquatic biota, productivity, mineral cycles and biodegradation in different ecosystem, biology and ecology of reservoirs.

### References

1. Glimpses of Biodiversity- B.Blosetti.
2. Environmental biodiversity- P.R.Yadav
3. Biodiversity of microbial life- Stanely Reysenbach
4. Ecology & Env. Biology Sathyanarayana Books & Allied (P) Ltd

## CORE PAPER: III

### Subject title: BIOCHEMISTRY

**Subject description:** This course presents the chemical reactions or metabolic functions in the living system and their regulations.

**Goals:** To make the student to understand the concept of biochemical regulations

**Objectives:** On successful completion the subject student should have understand:

Basic metabolism

Enzymes and their kinetics

Applications of metabolites

#### UNIT I

Structure of atoms and biomolecules: atomic theory, valency, atomic weight, molecular weight, Molarity.

Chemical Bonding, properties of Water ionization  $p^H$  and buffers

#### UNIT II

Introduction to Biochemistry: Fundamental Structures of proteins, nucleic acid, lipid and carbohydrates.

Thermodynamics in biology: Energy metabolism. Free energy, energy rich bonds, weak interactions, coupled reactions, kinetics, association dissociation concepts, biological energy transducers.

#### UNIT III

Enzymes and co-enzymes, IUB classification and nomenclature of enzymes, enzyme kinetics (positive and negative cooperativity), regulation of enzyme activity, active sites, activators and inhibitors; allosteric enzymes

#### UNIT IV

Classifications and reactions of sugars. structural features of polysaccharides. Glycolysis, TCA cycle, glycogen breakdown and synthesis, gluconeogenesis, bioconversion of pentoses and hexoses, ETC, Oxidative and photo phosphorylation

Classification and functions of lipids.

Metabolism of lipids; Fatty acid biosynthesis and oxidations,

#### UNIT V

Amino acids and peptides – classifications chemical reactions and physical properties, metabolisms of amino acids. Functions of proteins. Biosynthesis and degradation of nucleic acids (purines and pyrimidines) Integration of metabolism and regulations.

Secondary metabolites –applications,

isoprenoids and hetero cyclic compounds

## REFERENCES:

1. Boyer.R., (2002) Concepts in Biochemistry 2<sup>nd</sup> ed. Brooks/cole publishing company New York.
2. David L. Nelson and M. Cox (2003) Lehninger's Principles of Biochemistry, 3<sup>rd</sup> Ed, Worth publication New York
3. Voet & Voet (1995) Fundamentals of Biochemistry, 2<sup>nd</sup> Ed, John Wiley and sons inc., New York.
4. Geoffery L Zubay (1995) Principles of Biochemistry, WCB publishers, London
5. Murrey RK., D.K. Granner, P.A. Mayers and V.W. Rodwell, (2003) Harper's Biochemistry, Prentice –Hall Int, Boston
6. Outlines of Biochemistry Conn & Stumph
7. Biochemistry 3<sup>rd</sup> ed Sathyanarayana Books & Allied (P) Ltd

**CORE PRACTICAL I:****LAB IN: CELL BIOLOGY AND BIOCHEMISTRY.**

1. Microscopy
2. Cell Types --- Microbial, animal and Plant cells – simple staining and visualization through microscope
3. Fraction of Cellular components—Demonstration.
4. Mitotic Preparation – Onion Root Tip, Grasshopper *Hepatic coacae*
5. Meiotic Preparation from Grasshopper Testis and flower buds of *Rheo discolor*
6. Cell Staining – Cytochemical Methods for Demonstration of Cellular and sub-cellular components.
7. Estimation of Protein – Lowry's, Bradford's method.
8. Estimation of DNA--- DPA Method.
9. Estimation of RNA by Orcinol method
10. Estimation Of Sugars ---Anthrone and Benedict method
11. Estimation of total free amino acids --- Sulfovnicillin method.
12. Estimation of Lipids.
13. Analysis of Oils—Iodine Number---Saponification Value ---Acid Number.
14. Quantification of Vitamin C.
15. Thin Layer Chromatography.
16. Paper Chromatography.
17. Isolation of Enzymes.
18. Enzyme assay.
19. Determination of Km value.

## **CORE PAPER: IV**

### **Subject Title: MICROBIOLOGY**

**Subject description:** This course presents the study of Micro organisms.

**Goals:** To make the student to understand Micro organisms and their participation in day to day activities.

**Objectives:** On successful completion the subject student should have understand:

What are micro organisms?

Their studying methods and their positive and negative on our lives

#### UNIT I:

Definition and scope of microbiology-- A general account on microbial diversity. Basic principles in microscopy, Types of microscopes- light, dark, phase contrast, fluorescent and electron microscope- (Transmission and Scanning electron)

#### UNIT II:

A detailed account of General structure, growth and reproduction of the various Bacteria, fungi and Viruses. Economic and industrial importance of yeast and moulds

#### UNIT III:

Microbiological Media: Types, preparation, methods of sterilization; enumeration of microorganisms in soil, water and air; isolation of microorganisms from Environment and infected tissue; Techniques of pure culture, maintenance and Preservation; Staining: stains and types of staining;

#### UNIT IV:

Physiology and biochemistry of microbes--Nutrition (Photo-autotrophs, Chemo-autotrophs, Parasitism, Saprophytism, Mutualism and Symbiosis, Commensalisms, endozoic microbes) - - microbial pathogens of plants, animals and Humans.

#### UNIT V:

Respiration and fermentation, Nitrogen metabolism including Nitrogen fixation (Symbiotic and asymbiotic), Lipid metabolism, Secondary metabolism, Production of enzymes and antibiotics--Role of microbes in biogeochemical cycles.

#### References:

1. Michael T. Madigan John M. Martin & Jack Parker, 1984, Biology of Microorganisms Prentice Hall International, Inc., London.
2. Edward A. Birge, 1992, Modern Microbiology – Principles and application. Wm.C. Brown Publishers, Inc. U.S.A.
3. Gerard J. Tortora, Berdell R. Funke, Christine & L. Case, 2001, Microbiology - An Introduction. Benjamin Cummings, U.S.A.
4. Danial Lim, 1998, Microbiology, McGraw-Hill Companies, New York.
5. Stephen A. Hill, 1984, Methods in Virology. Blackwell Scientific Publication, London.

**CORE PAPER: V**

**Subject Title: GENETICS**

**Subject description:** This course presents the way characters get transferred through generations and methods to analyze and modify them

**Goals:** To make the student to understand the concept of genes and their behaviour

**Objectives:** On successful completion the subject student should have understand:

Basic genetics

Gene expression and regulation

**UNIT I**

History of Genetics - Mendelian Principles, Segregation, Independent Assortment, Dominance relations, Multiple alleles, Incomplete dominance, Over dominance,

**UNIT II**

Gene interaction, Epistasis, lethality and lethal genes, Sex determination and sex linkage in diploids, linkage and crossing over, gene mapping. Chromosomal theory of inheritance, maternal effects.

**UNIT III**

Chromosomal variation in number, Changes in Chromosomal structure, Chromosomal aberrations, Genetics of Hemoglobin, Transposable elements in prokaryotes and eukaryotes.

**UNIT IV**

Fine structure of Gene, cistron, recon, Structure of Eukaryotic gene, Experimental evidence for DNA as the genetic material, cytoplasmic genetic systems- mitochondria and chloroplast DNA, Plasmids- F, R and Col plasmids. Relation between genes and polypeptides.

**UNIT V**

Population genetics, calculating gene frequency, factors affecting gene frequency. Genetic control of Development in Drosophila and Arabidopsis. Genetic drift, Shift, Pedigree analysis and genetic counseling.

**Reference:**

1. Basic genetics by D.L.Hartl,1991,Jones and Bartett public.
2. Friedfelder 1987, Microbial genetics ,Jones and Bartett public.
3. Molecular Biology of the genes 4<sup>th</sup> Ed. Watson et.,al, the Benjamine /cummings coins 1987
4. Molecular cell biology, 1994.Lodish, Baltimore scientific American books,Inc.
5. Genetics Strickberger.M
6. Genetics by Goodenough

## Diploma Paper I:

### Subject Title: HUMAN PHYSIOLOGY

**Subject description:** This course presents the various physiological activities in human being

**Goals:** To make the student to understand the human physiology

#### Objectives:

After the completion of the course the student should have understood various systems in human and their activities

#### UNIT I

MUSCLE- skeletal muscles – composition – functions and properties of plain (smooth) and cardiac muscles – electromyography

NERVOUS SYSTEM – organization – basic functions of synapses and transmitter substances – sensory receptors – sense of hearing – taste and smell. Special senses – optics of vision – function of retina – cortical and brain stem control of motor function . Cerebellum – limbic and hypothalamus – states of brain activity cerebral blood flow, cerebrospinal and brain metabolism

#### UNIT II

BLOOD & BODY FLUID – blood cell –Haematosi s – determination of coagulation – plasma proteins – platelets – leucocytes. Bone marrow – functions of tissue fluid – Lymph nodes

CADIO VASCULAR SYSTEM – Heart as pump – rhythmic excitation – electrocardiogram – cardiac arrhythmias. Circulation- functions of arterial and venous system – microcirculation and lymphatic system – rapid control of arterial pressure- hypertension – cardiac failure – heart sounds

RESPIRATORY SYSTEM- pulmonary ventilation – pulmonary circulation – gaseous exchange - O<sub>2</sub> and CO<sub>2</sub> transport in blood and body fluids – mechanism of breathing - ventilation

#### UNIT III

DIGESTIVE SYSTEM – digestive tract – gastrointestinal function – motility– secretory functions of alimentary tract – digestion and absorption.

EXCRETION – functions of kidney – renal associated mechanisms - extracellular and intracellular fluids – osmolality and sodium concentration – regulation of blood volume – excretion – regulation of urea, potassium – regulation of acid base balance. Micturition – skin – sweat

ENDOCRINES – pituitary hormones and their control by hypothalamus – thyroid metabolic hormones – adreno-cortical hormones – insulin, glucagons and Diabetes mellitus – parathyroid hormone, calcitonin. Gonadotrophic hormones –testosterone – estrogen – corpus leutem - progesterone – Endometrical and menstruation – puberty – menopause – pregnancy and lactation – fetal and neonatal physiology

References:

1. Text book of Medical physiology by Guyton . 8<sup>th</sup> edition . W B Saunders company. USA
2. Human physiology by Dr.C.Chatterjee I & II. Medical Allied Agency, Kolkatta.
3. Anthony's Text book of Anatomy and Physiology by Gary A. Thiodeare & Kevin T patton, 2<sup>nd</sup> edition . Moshi year book, New York
4. Anatomy and Physiology by Ross & Wilson 8<sup>th</sup> edition. Churchill livingstone
5. Human physiology by Sarada Subramaniam & K.MadhavanKutty. S.Chand and company, New Delhi
6. Human Physiology by Vander Sherman Luciano McGraw Hill NewYork.

**CORE PAPER: VI**

**Subject Title: BIOINFORMATICS**

**Subject description:** This course presents the fundamentals of Information processing

**Goals:** To make the student to understand the concept Informatics

**Objectives:** On successful completion the subject student should have understand:

Methods to retrieve and submit data

Genome data bases and other databases and their analysis

**UNIT I**

Introduction and history of bioinformatics – Internet, World Wide Web, Web browser, EMB net, NCBI. File transfer protocol. Search engines

**UNIT II**

Database- Definition, DBMS – Biological Databases – FASTA, Blast, Genbank, DNA sequence databases, Protein databases. Entry formats, carbohydrate databases, Enzyme databases, Pathway databases. Relational database model. Theory on RDBMS. SQL, introduction to access, making queries. Designing forms. Report design

**UNIT III**

Genomic resources, Gene structure and DNA sequences. EST searches, gene hunting, gene finders, Expression analysis- SAGE, cDNA library, EST, Microarray – DNA sequencing and sequence alignment – RFLP, SNP, RAPD, Human Genome Project, RNA analysis.

**UNIT IV**

Proteomics – proteome analysis – 2D gel electrophoresis, Mass spectrophotometry, protein – protein interaction, protein – DNA interaction. Enzyme – Substrate interaction, pathway analysis.

**UNIT V**

Application aspects – target searchings – drug designing – E- cell, phylogenetic analysis, PERL, Chemoinformatics

References:

1. Introduction to Bioinformatics T.K.Altwood, D.J.Parry-smith (2004) Pearson Education
2. Bioinformatics for the beginners K.Mani & N.vijayaraj
3. Proteomics- Pennigton & Dunn (2002) Viva books publishers, New Delhi
4. Bioinformatics- A practical guide to the analysis of genes & protein 2<sup>nd</sup> ED Andreas, Baxevanis and Francis Ouellette.
5. The internet (1999) Christian Crumlish. BPB publications.

**CORE PRACTICAL II:**

**LAB IN: MICROBIOLOGY AND GENETICS.**

1. Laboratory rules and regulations of Microbiology
2. Media preparation and sterilization
3. Enumeration of microorganism from soil, water and spoiled food--- serial dilution technique.
4. Pure culture technique—Pour plate, spread plate and streak plate methods.
5. Isolation of single colonies of bacteria
6. Auxotrophic selection
7. Measurement of growth of bacteria.
8. Measurement of growth of Phage.
9. Staining of bacteria—Gram's; Spore, capsule, acid fast bacilli.
10. Fungal Staining --- Wet Mount technique.
11. Drosophila – Morphology, Section culture and maintenance.
12. Identification of Mutants—Physical and Chemical Methods.
13. Experiments to determine Mendel's law.
14. Monohybrid and dihybrid cross using plants.
15. Salivary Gland chromosome of
16. Human karyotype --- demonstration.
17. Sex chromatin (buccal smear).

**DIPLOMA PAPER II:**

**Subject Title: HUMAN PATHOLOGY**

**Subject description:** This course presents the diseases of human being

**Goals:** To make the student to understand the concept Pathology

**Objectives:** On successful completion the subject student should have understand: Pathogen, disease and metabolic disorders.



## UNIT I:

An introduction to Biotechniques in clinical medicine: sampling, analysis, reporting, and interpretation of results. Disorders of Kidney: acute renal failure, chronic renal failure, proteinuria and nephritic syndrome and urinary calculi. Disorders of Liver: Biochemical assessment of liver function. Liver diseases: Acute hepatitis, chronic hepatitis, acute liver failure, Cirrhosis, alcohol and liver. Inherited abnormalities of bilirubin metabolism: Gilbert's, Crigler-Najjar, Dubin-Johnson, Jaundice, and Rotor. Drugs and the Liver. Biotechnological approaches to liver diseases: Vaccine development and drug delivery.

## UNIT II:

Disorders of Carbohydrate metabolism: Diabetes mellitus - Etiology and pathogenesis, diagnosis and management. Metabolic complications of diabetes: Ketoacidosis, pathogenesis, non - ketotic hyperglycaemia, Lactic acidosis, diabetic nephropathy, Lipoprotein metabolism in diabetes, Diabetes in pregnancy, glycosuria, hypoglycaemia - diagnosis and management. Disorders of Plasma proteins and enzymes: Hypoalbuminaemia, hypogammaglobulinaemia, hypergammaglobulinaemia. Alkaline phosphatase, Creatine kinase, Haemoproteins - Haemoglobinopathies, and abnormal haemoglobin derivatives-Methaemoglobin, Carboxyhaemoglobin. Secondary hyper lipidaemia, Types of Primary hyperlipidaemias. Lipoprotein deficiency-abetalipoproteinaemia. Diseases of Heart-Myocardial infarction, Heart failure and Hypertension. Inherited metabolic diseases: Glucose-6-phosphatase deficiency, Galactosaemia, Phenyl ketonuria, Cystic fibrosis

## UNIT III:

Disorders of hypothalamus and pituitary: Disorders of anterior pituitary hormones: Hypopituitarism, Anorexia nervosa, Growth hormone deficiency, Growth hormone excess: acromegaly and gigantism, Hyperprolactinaemia and Cushing's disease.

Disorders of Adrenal Glands:

Disorders of Adrenal cortex: Adrenal hypofunction (Addison's disease). Adrenal hyper function: Cushing's syndrome, conn's syndrome, congenital adrenal hyperplasia (CAH). Disorders of adrenal medulla: catecholamines.

Disorders of Thyroid gland: Hyperthyroidism, hypothyroidism, thyroiditis, goiter and thyroid cancer.

Metabolic aspects of cancer: Metabolic complications of cancer. Tumour markers:  $\alpha$ -Fetoprotein (AFP), Carcinoembryonic antigen (CEA), Para proteins, Human chorionic gonadotrophin (hCG), markers of prostatic cancer, enzymes as tumour markers and Carbohydrate antigen (CA) markers.

## REFERENCES:

1. Clinical Chemistry by William J. Marshall (Fifth edition, Mosby Publications).
2. An Illustrated color text of Clinical Biochemistry by Allen Gaw, Robert A. Cowan, illustrated by Robert Britton (1999, second edition, Churchill Living stone press).
3. Harper's Illustrated Biochemistry (27th Edition) by Robert K. Murray, Daryl K. Granner, Victor W. Rodwell.
4. Lippincott's Illustrated reviews: Biochemistry (Lippincott press, Third Edition) by Richard Harvey and Pamela C. Champe.

5. Medical Microbiology by Panicker Medical Microbiology by Roitt Medical Parasitology by Panicker
6. Color Atlas of Biochemistry (second edition, Thieme Publications, revised and enlarged) by Jan Koolman and Klaus-Heinrich Roehm.
7. Marks' Basic Medical Biochemistry: A Clinical Approach (2nd Edition), by Colleen M. Smith, Allan D. Marks and Michael A. Lieberman.
8. Medical Microbiology by Jawetz.

## **CORE PAPER: VII**

### **Subject Title: IMMUNOLOGY**

**Subject description:** This course presents the basic defense mechanism of animals

**Goals:** To make the student to understand the concept immunology

**Objectives:** On successful completion the subject student should have understand:  
Immunity, Antigen, Antibody, Cells of immune system and their function and regulations

#### **UNIT I:**

Introduction- Historical Development in Immunology. Immunity-. Humoral and Cell mediated response, Primary and Secondary immune response. Cells involved in immune response. Innate and Acquired Immunity. Mechanisms of defense.

#### **UNIT II:**

Antigen- Types and classifications. Antibody – Structure, Types, properties and their biological functions, poly clonal sera, Monoclonal antibody. Primary and Secondary lymphoid organs – Thymus, Bone marrow, Lymph nodes and Spleen. Lymphocytes traffic and regulation, CD molecules

#### **UNIT III:**

Hematopoiesis and development of B and T lymphocytes. Immunoglobulin Gene expression B cell and T cell activation. MHC molecules Response of B cells to antigens. Plasma Cells, Memory Cells.

#### **Unit IV**

Complement – activation and regulation. Cytokines- structure and functions, Interferons and interleukins. Immuno regulation: Tolerance. Suppression, Autoimmunity and hypersensitivity reactions .Primary and secondary Immuno deficiency disorders.

#### **UNIT V:**

Transplantation, HLA Typing; Mechanism of Graft rejection. Tumor immunology.Immuno surveillance- mechanisms.

Antigen – Antibody Interactions. Immunodiffusion and Immuno electrophoresis. Principle and Applications of RIA, ELISA, Fluorescent Antibody techniques. I

REFERENCES:

1. Immunology – Kuby., J - 5<sup>th</sup> Edition
2. Immunology – Tizard
3. Immunology – Ivan M. Roitt – Third Edition
4. Immunobiology – Janeway and Travers – 5<sup>th</sup> Edition

**CORE PAPER: VIII**

**Subject Title: PLANT BIOTECHNOLOGY**

**Subject description:** This course presents the application of Plants in Biotechnology

**Goals:** To make the student to understand usage of Plants and methods to improve their utility

**Objectives:** On successful completion the subject student should have understand:  
Crop development, Callus culture, Biotechnological applications of plants

UNIT I

Conventional methods of crop improvement- Selection, mutation, polyploidy and clonal selection.

UNIT II

Plant genome organization, gene families in plant. Organization of chloroplast genome, nucleus- encoded and chloroplast encoded genes for chloroplast proteins. Organization of mitochondrial genome- nuclear and mitochondrial encoded genes for mitochondrial proteins, cytoplasmic male sterility. Seed storage proteins and heat shock proteins.

UNIT III

Plant tissue culture. Callus culture, organogenesis, meristem culture, anther, pollen, embryo culture and their applications .somatic hybridization Somatic embryogenesis, cybrids.

UNIT IV

Symbiotic nitrogen fixation in legumes -Biochemistry and molecular biology, gene rearrangement and nitrogen fixation in cyanophytes. Agrobacterium and Crown gall tumors. Ti plasmid vectors for plant transformation, agro-infection. Classification of plant viruses, molecular biology of plant stress response.

UNIT V

Direct transformation of plants by using physical methods Genetic engineering in plants, selectable markers, reporter genes and promoters used in plant vectors.. Genetic engineering of plants for virus resistance, pest resistance, herbicide tolerance, delay of fruit

ripening, resistance to fungi and bacteria. Production of antibodies, viral antigens and peptide hormones in plants. Importance of RFLP in plant breeding. Management aspect of plant genetic engineering, tagging and cloning of plant genes..

#### REFERENCE

1. An introduction to genetic engineering in plants, Mantel. S. H, Mathews. J. A, Mickee. R. A
2. Revolution on biotechnology, Marks. J.L.
3. Plant genetic engineering, Dodds J.H.
4. Plant molecule biology, Grierson and S.V. Convey
5. Molecular biotechnology, Principle and applications of recombinant DNA technology, Bernard R Glick.
6. Plant Biotechnology-Monica Hughes.

#### CORE PAPER: IX

##### **Subject Title: ANIMAL BIOTECHNOLOGY**

**Subject description:** This course presents the usage of Animals in biotechnology and their improvement

**Goals:** To make the student to understand the Animal products and exploitation of them in Biotechnology

**Objectives:** On successful completion the subject student should have understand: Animal tissue culture, Animal products, production & improvement of them.

#### UNIT I

Animal cell culture: Fundamentals. facilities and applications. Media for Animal cells. Biology of cultured cells, measurement of growth, cell synchronization, senescence and apoptosis

#### UNIT II

Types of cell culture: Primary cell culture, secondary culture, cell transformation, cell lines, stem cell cultures, cell viability and cytotoxicity. Organ culture. Cryopreservation Insect cell lines

#### UNIT III

Genetic engineering in animals: methods of DNA transfer into animal cells- calcium-phosphate co precipitation, micro-injection, electroporation, Liposome encapsulation, Billogical vectors. Hybridoma technology, Vaccine production.

#### UNIT IV

Embyology: Collection and preservation of embryo, culture of embryos, culture of embryonic stem cells and its applications. Gametogenesis and fertilization in animals, Molecular events during fertilization, genetic regulations in embryonic development.

## UNIT V

Transgenics: Transgenic animals. Production and recovery of products from animal tissue cultures: cytokines, Plasminogen activators, Blood clotting factors, Growth hormones.

### REFERENCES:

1. Animal cell culture – a practical approach, 4<sup>th</sup> ED., Freshney. John Wiley Pub.,
2. Methods in Cell Biology. VOL 57 Animal methods, ED Mather & Barnes, Academic Press.
3. Mammalian Cell Biotechnology- A practical approach. ED Butler. Oxford UNI Press.
4. Exploring Genetic mechanisms. ED Singer & Berg.

## Gr: C (Application Oriented Subject A) Paper I

### Subject Title: MOLECULAR GENETICS

**Subject description:** This course presents the genetics at molecular level

**Goals:** To make the student to understand the molecular genetics

#### UNIT- I

DNA as genetic material; Organization of genome – Structure and function of DNA and RNA; DNA replication – conservative, semi conservative, unidirectional, bidirectional replication; Enzymology of replication; *in-vitro* DNA synthesis

#### UNIT – II

Gene as the unit of expression; Colinearity: Transcription and gene regulation in prokaryotes and eukaryotes; elucidation of genetic code.

#### UNIT – III

Translation of protein – post translational modifications and folding of newly assembled polypeptides; transit peptide and signal sequences – protein export

#### UNIT - IV

Gene mutation – Biochemical basis of mutations – types of mutations- spontaneous and induced mutations; Ames test for mutation; DNA damage – types of DNA repair and mechanisms – photo reactivation excision repair, post replication recombinant repair, SOS repair

#### UNIT - V

Genetic exchange – bacterial transformation, transduction, conjugation and their mapping, linkage and chromosome mapping, crossing over, gene targeting.

## REFERENCES

1. Basic Genetics by D.L. Hartl 1991, Jones & Bartett publications.
2. Microbail Genetics, Friefelder 1987 – Jones & Bartnett publications
3. Molecular Biology of the gene 4<sup>th</sup> edition by Watson et al, The Benjamin / Cummings co
4. Molecular Cell Biology by Lodish 1994, Baltimore Scientific American Brocks

## Gr: C (Application Oriented Subject A) Paper II

### Subject Title: BIOLOGY OF CLONING VECTORS

**Subject description:** This course presents the types of cloning vehicle

**Goals:** To make the student to understand the concept of vector preparation, gene manipulation and gene transfer technologies

**Objectives:** On successful completion the subject student should have understand:  
Biology of plasmid, usability of plasmid and viral particles as vectors

#### UNIT-I

Introduction to cloning vectors: Plasmid Biology. *E.coli* vector; properties of plasmid (plasmids in gene transfer) plasmid compatibility, copy number control, PBR<sup>322</sup>, BAC and expression vectors in prokaryotes. Site - directed mutagenesis, m RNA isolation, cDNA synthesis. Genomic and cDNA liobraries.

#### UNIT II

Molecular biology of lambda, Lambda vectors; cosmid, phagemid. *in-vitro* packaging, M13 and other viral vectors of prokaryotes.

#### UNIT-III

Cloning in Yeast: genetics of *S.cerevisiae*, identification of Yeast genes, Yeast vectors, YAC. Cloning in Bacillus. Plasmids and vectors, inducible promoters. Cloning in Streptomyces.

#### UNIT-IV

Animal vectors; Selectable markers, SV40 Vectors, papiloma virus, Retero virus, Vaccinia virus. Bacculo virus  
Ti plasmid as gene vector, Caulimo viruses, Gemini viruses, Transposable elements, RNA viruses, viroids

## UNIT-V

Manipulation of genes for the Safety r DNA research. Laboratory and industrial applications. Reproductive engineering, Human genetic diseases, gene therapy, genetic manipulation of germ cells

### REFERENCES:

1. Ernst.L.Winnacker, (2003) from genes to clones, 2nd edition, Panima publishing corporation, NewDelhi.
2. Benjamin Lewin (2004) Genes VIII, Pearson Education corporation, New Jersey
3. Alberts B, (1994) molecular biology of the cell, Garland publishing Inc New York
4. Friedfielder.D, (1987), Molecular biology II Ed., Narosa publishing house, New Delhi.
5. J.d.Watson (2001) Recombinant DNA technology, 2<sup>nd</sup> Ed WH Freeman and Company, New York
6. Brown T.A (1998) Introduction to gene cloning 3<sup>rd</sup> ED Stanley Thomas Pub ltd, Germany
7. Primrose S.B (2003) Principles of gene manipulation 6<sup>th</sup> Ed Black well Sci ltd, Germany.

## DIPLOMA PAPER III

### Subject Title: DIAGNOSTIC TOOLS

**UNIT I Subject description:** This course presents the Diagnostic methods of diseases

**Goals:** To make the student to understand the concept of Diagnostic methods

**Objectives:** On successful completion the subject student should have understand:  
Examination of Blood, Urine and CSF.

#### UNIT I

Blood examination – anticoagulant, hemoglobin, RBC, Packed cell volume, ESR, WBC total, differential normal and abnormal hematopathies – anemia, bone marrow smear, leukemia and myelodysplastic syndromes, diagnostic significance of PB smear, hemorrhagic disorder, L.E. cell phenomenon.

#### UNIT II

Urine analysis – collection – physical, chemical and microscopic examination of urine – CSF  
Parasite analysis

#### UNIT III

Histopathology Biochemical analysis of Blood, Blood banking, Transplantation, AIDS, Lab safety, ELISA, RIA, FACS, PCR, Computers in lab. Quality control.

REFERENCE:

1. Handbook of medical lab technology – Ed; V.H.Talib, CBS publication
2. Clinical Chemistry by Willium J.Marshall (Fifth edition, Mosby Publications).
3. An Illustrated color text of Clinical Biochemistry by Allen Gaw, Robert A.Cowan, illustrated by Robert Britton (1999, second edition, Churchill Living stone press).
4. Marks' Basic Medical Biochemistry: A Clinical Approach (2nd Edition), by Colleen M. Smith, Allan D. Marks and Michael A. Lieberman.
5. Medical Microbiology by Jawetz.

**CORE PAPER: X**

**Subject Title: MICROBIAL BIOTECHNOLOGY**

**Subject description:** This course presents the utility of Microbes

**Goals:** To make the student to understand the applications of Microbes

**Objectives:** On successful completion the subject student should have understand:  
Fermentation, Microbial products, Vaccine and antibiotics.

UNIT I:

Microbial Biotechnology: Scope and application-horizons of microbial Technology, public concern about the microbial biotechnology and Economics of microbial biotechnology.

UNIT II:

Microbes: Living factories for macromolecules-Production of proteins in Bacteria and yeast; recombinant and synthetic vaccines; microbial insecticides (*Bacillus.thuringiensis*, *B.spaerinus*, *B.papilliae* and Baculo-Viruses); microbial enzymes application in starch processing , textile designing, detergents, cheese making;polysaccharides and polyesters.

UNIT III:

Microorganisms in fermentation-Ethanol from feed stocks to fermentable Sugars, from sugars to alcholos, clostridial fermentation, lactic acid fermentation, acetic acid production and industrial production of various milk products.

UNIT IV:

Metabolites from microorganisms-amino acids; antibiotics-antibacterial agents ( $\beta$ -lactams, tetracyclines, peptides, amino glycosides), antifungal agents, anti-tumor antibodies.

UNIT V:

Application of microbial biotechnology in sewage and wastewater treatment, degradation of xenobiotics, mineral recovery, removal of heavy metals from aqueous effluents, production of biofertilizers (nitrogen fixing Bacteria, single cell protein, mycorrizha and phosphate solubilizing Bacteria).



REFERENCES :

1. Glazer, A.N. and Nikaido, H. 1995. Microbial biotechnology. W.H.Freeman & Co.,New York
2. Encyclopedia of Microbiology. 1992. Vols.1-4. Academic Press.
3. Preve et al. 1987. Fundamentals of Biotechnology. VCH Publ.
4. Stanbury, P.F. Whittaker, A, Hall, S.J. 1995. Principles of fermentation technology.Butterworth Heinemann.
5. Prescott, L.M. Harley, J.P. and Klein, D.A. 1999. Microbiology. McGraw Hill Co.
6. Glick, B.R. and Pasternak, J.J. 1998. Molecular Biotechnology. Washington D.C. ASM Press.
7. Stainer, R.Y. Ingraham, J.L., Wheelis, M.L. and Painter, P.R. 1987. General Microbiology. Macmillan Co.
8. Lancini, G. Parenti, F. and Gallo, G.G. 1995. Antibiotics-A multidisciplinary Approach. Plenum Press, New York.
9. Gunasekaran.P. 1995. Laboratory manual in microbiology. New Age International Limited. New Delhi.

**CORE PAPER: XI**

**Subject Title: ENVIRONMENTAL BIOTECHNOLOGY**

**Subject description:** This course presents the Study and the Management of the Environment

**Goals:** To make the student to understand Ecology and Conservation of the Environment

**Objectives:** On successful completion the subject student should have understand: Ecosystem, Natural cycles. Diversity.

UNIT I:

Scope – Branches of ecology – Abiotic factors – water – soil – temperature – light. Biotic factors – Animal relationship – symbiosis – commensalisms – mutualism –Antagonism – Antibiosis – Parasitism – Predation – competition.

UNIT II:

Ecosystem –Definition –structure – pond ecosystem – primary production –secondary production – food chain – food web – trophic levels – energy flow – pyramid of biomass– pyramid of energy. Biogeochemical cycle: Nitrogen and Phosphorous.

UNIT III:

Pollution – types – sources – effects – Air-water – land – Noise – Thermal – Pesticide – Radioactive – green house effect, ozone and its importance – global warming – Acid rain– Bio accumulation – Bio magnification. Biological control. Principles of environment Impact. Assessment and environmental monitoring.

**UNIT IV:**

Uses and values of Biodiversity -A very general account on uses of Bioresources-plant uses: food, timber, medicinal ornamental and other uses- animal uses: food animals (terrestrial and aquatic), non food uses of animals, Domestic livestock-uses of microbes. Valuing Biodiversity-Instrumental (Goods, Services, and Information and Psychospiritual values) and Inherent or Intrinsic values, ethical and aesthetic values-An outline account on methods of valuing biodiversity. A general account on multilateral treaties- the role of CBD, IUCN, GEF, IBPGR, NBPGR, WWF, FAO, UNESCO and CITES-Bioresources, Biotechnology and Intellectual property rights:

**UNIT V:**

Conservation of Biodiversity - Current Practices in conservation - Habitat or ecosystem approaches – Speciesbased approaches - Social approaches -Chipko movement - *In situ* (Afforestation, Social Forestry, Agro forestry, Botanical Gardens, Zoos, Biosphere Reserves, National Parks, Sanctuaries, Sacred Groves and Sthalavrikshas) and *Ex situ* (Cryopreservation, Gene Banks, Seed Banks, Pollen Banks, Sperms Banks, DNA Banks, Tissue Culture and Biotechnological Strategies), ecorestoration, environmental education.

**REFERENCES:**

1. Groombridge, B (Ed.) 1992. Global Biodiversity – Status of the Earth’s Living Resources. Chapman & Hall, London.
2. UNEP, 1995, Global Biodiversity Assessment , Cambridge Univ. Press, Cambridge.
3. Virchow, D. 1998. Conservation & Genetic Resources , Springer – Verlag, Berlin.
4. Gary K.Meffe & .Ronald Carroll ,C.1994. Principles of Conservation Biology, SinauerAssociates, Inc., Massachusetts.
5. Clarke, G.L. 1954, Elements of ecology, John Wiley & sons. N.Y.
6. Kendeigh, S.c. 1961. Animal Ecology. Prentice Hall.
7. Odum, E.P. 1971. Fundamentals of Ecology. W.B.Saunders company, Philadelphia.
8. Rastogi, V.B. and M.S. Jayaraj, 1989. Animal ecology and distribution of animals, Kadamath Ramnath.
9. Sharma, P.D. 1990. Ecology and environment. Rsatogi publications, Meerut.
10. Southwick, C.H. 1976. Ecology and the quality of environment D.Van.Nostrand Co.,
11. Verma P.S. and V.K. Agarwal. 1996.Principles of Ecology S.Chand. & co., New Delhi.

**Gr C (Application Oriented Subject B) Paper I****Subject Title: RECOMBINANT DNA TECHNOLOGY AND BIOETHICS**

**Subject description:** This course presents the mechanism of gene manipulation

**Goals:** To make the student to understand the concept of gene manipulation and gene transfer technologies

**Objectives:** On successful completion the subject student should have understand:

Manipulation of genes

Transfer techniques

Expression systems and methods of selection

UNIT I:

Restriction and Modification systems of Bacteria. Restriction enzyme: DNA Polymerases, DNALigase, methylase, Taq polymerase, polynucleotide kinase, alkaline phosphatase, reverse transcriptase, DNaseI, S1nuclease, RnaseH, terminal deoxynucleotidyl transferase, RNA polymerase.

UNIT II:

Types and methods in probe construction, methods of labeling gene probes, identification of recombinant DNA. Construction of DNA libraries and genomic libraries, protein engineering.

UNITIII:

Introduction of cloned genes into the host cells: Transformation, transduction, Particle gun, electroporation, liposome mediated and co-cultivation.

UNIT IV:

Recombinant DNA techniques: Anti sense technology, terminator gene technology, site directed mutagenesis, Human genome project, hybridization techniques-southern, Western and Northern blotting, Chromosome walking. PCR, RFLP, RAPD, DNA finger printing, Micro array and sequencing, gene therapy, DNA sequencing.

UNIT V:

Public acceptance issues for biotechnology: Case studies/experiences from developing and developed countries. Biotechnology and hunger: Challenges for the Indian Biotechnological research and industries. The Cartagena protocol on biosafety. Biosafety management: Key to the environmentally responsible use of biotechnology. Ethical implications of biotechnological products and techniques. Social and ethical implications of biological weapons.

REFERENCES:

1. Ernst.L.Winnacker, (2003) from genes to clones, 2nd edition, Panima publishing corporation, NewDelhi.
2. James.D.Watson(2001) Recombinant DNA technology, 2<sup>nd</sup> edition, WH Freeman and company, New York.
3. Glick and Pasternak,(1996),Molecular biotechnology, Panima publishing corporation.NewDelhi.
4. BrownT.A., (1998) Introduction to gene cloning, 3rd edition, Stanley Thomas Publishing Ltd, London.
5. PrimroseS.B., (2003) Principles of gene manipulation, 6<sup>th</sup> edition, Blackwell Science Ltd, Germany.
6. Cartagena Protocol on Biosafety, January 2000.

7. Biological Warfare in the 21st century, by M.R. Dano, Brassies London, 1994.
8. Safety Considerations for Biotechnology, Paris, OECD, 1992 and latest publications.

## Gr C (Application Oriented Subject B) Paper II

### Subject Title: BIOPHYSICS AND BIOINSTRUMENTATION

**Subject description:** This course presents study of Biophysics and Instrument of Biological Importance.

**Goals:** To make the student to understand the methods to analyze Biomolecules.

**Objectives:** On successful completion the subject student should have understand: Analytical methods and Molecular structures.

#### UNIT I:

Conformation of Biological Macromolecules – Structure of Proteins – Primary, Secondary, Tertiary and Quaternary – Composition of proteins – Amino acids – Properties – Structure of Nucleic Acids – Primary, Secondary, Tertiary and Quaternary – Composition of nucleic acids – Nucleoside and Nucleotides – Properties of nucleic acids – Polysaccharides – Lipids.

#### UNIT II:

Forces that stabilizes the Macromolecules – Proteins and Nucleic acids – Hydrogen Bonding – Hydrophobic interactions – Ionic interactions – Disulfide Bonds – Glycosidic Bonds.

#### UNIT III:

Techniques for the study of biological structure – Spectroscopy – Principles and applications of UV, Visible, NMR, Infra red and Raman Spectroscopy. X – Ray Scattering and Diffraction.

#### UNIT IV:

Separation Methods – Chromatography – Affinity, Column, Paper, Thin Layer, Ion Exchange, HPLC, Gel Filtration and GC.

#### UNIT V:

Separation Methods – Sedimentation – Centrifugation – Ultracentrifugation – Diffusion – Macromolecular Diffusion - Electrophoresis – Agarose gel, Native PAGE and SDS – PAGE.

#### REFERENCES:

1. Biophysical Chemistry – Cantor and Schimmel – W.H. Freeman and Company, 2001
2. Practical Biochemistry – Keith Wilson and John Walker – Cambridge University Press – 5<sup>th</sup> edition, 2003
3. Basic Biophysics for Biologist – M.Daniel – Agrobios (India), 2005.

**CORE PRACTICAL III:****APPLIED BIOTECHNOLOGY**

1. Fermentor Design and Working Principle
2. Organic acid Production -- Citric acid (solid state or submerged).
3. Production and assay of extra cellular enzyme – Protease—submerged.
4. Wine Production.
5. Antibacterial sensitivity test.
6. Production of an Antibiotic
7. Preservation and maintenance of cells.
8. Identification of fungal spoilers. (Aspergillums, Mucor).
9. Plant tissue culture media preparations.
10. *In-vitro* germination of seeds.
11. Callus induction and differentiation.
12. Embryo culture.
13. Somatic embryogenesis.
14. Isolation and fusion of protoplast.
15. Artificial seed production.
16. Meristem culture.
17. Micro propagation.
18. *Agrobacterium* mediated gene transfer --- Demonstration.

**AOS PRACTICAL IV:****LAB IN IMMUNOLOGY AND rDNA TECHNOLOGY.**

1. Preparation of Antibodies.
2. Antigen- Antibody Reactions.
3. Immuno diffusion. (Single radial, double and rocket)
4. Blood grouping.
5. Preparation of serum from blood.
6. Method of immunization and bleeding.
7. ELISA- Demonstration.
8. Immuno assay and Typhoid antibodies.
9. Salt precipitation of Immunoglobulin.
10. Agarose gel Electrophoresis.
11. Isolation of Genomic DNA—Bacteria, Plant and Animal.
12. Isolation of Plasmid DNA.
13. Isolation of RNA.
14. Restriction Digestion.
15. Isolation of Phage DNA.
16. Transformation.
17. Southern blotting --- Demonstration.
18. Northern blotting --- Demonstration.
19. Western blotting --- Demonstration.
20. PCR-. Demonstration.
21. Construction of restriction Map of plasmid DNA --- Demonstration.

## DIPLOMA PAPER IV

### Subject Title: PHARMACOLOGY

**Subject description:** This course presents Medicines for different disease

**Goals:** To make the student to understand the concept therapy.

**Objectives:** On successful completion the subject student should have understand:  
Drug administration, drug metabolism and allergy.

#### UNIT I

Pharmacology – origins and antecedents – Pharmacology in the 20<sup>th</sup> century – Drugs – Sources, dosage forms and routes of administration. Absorption, factors modifying drug absorption, distribution, metabolism – Phase I, II reactions, action of cytochrome P450

#### UNIT II

Targets for drug action, receptor proteins, ion channel and drug targets, control of receptor expression, assay of drug potency: Chemical, bioassay and immunoassay-Drug tolerance and drug dependence. Principles of basic Pharmacokinetics, Adverse response to drugs, drug intolerance, drug allergy, tachyphylaxis, drug abuse, vaccination against infection, factors modifying drug action and effect.

#### UNIT III

Mechanism of action of drugs used in therapy of

- a) Respiratory systems – cough, bronchial asthma, pulmonary tuberculosis
- b) Cancer chemotherapy
- c) Antimicrobial drugs – sulfonamide, trimethoprim, penicillins, aminoglycosides and bacterial resistance.
- d) Thyroid and anti thyroid drugs, insulin and anti diabetic drugs, anti fertility and ovulation inducing drugs.

#### References:

1. Pharmacology – 5<sup>th</sup> edition – H.P.Rang, M.M.Dale, J.M.Ritter, P.K.Moore
2. The Pharmacology, Volume I and II – Goodman and Gillman
3. Basic Pharmacology – Foxtor Cox. Butterworth's 1980
4. Pharmacology and Pharmacotherapeutics – R.S.Satoskar, S.D. Bhandhakam and S.S. Alinapure
5. Principles of Medicinal Chemistry – William O.Foye – B.I. Waverks. Pvt. Ltd, New Delhi

**B.Sc., BIOTECHNOLOGY-SAMPLE QUESTION PAPERS****I semester****Core paper I CELL BIOLOGY**

Duration: 3 hrs

marks: 100

Section –A

Answer all

(10XI=10)

1. Histones
2. Proteins
3. lysozyme
4. Erythrocyte
5. Chiasma.
6. Inner membrane folding towards the matrix in mitochondria is called-----7.the proteinous part of enzyme is called-----
8. Micro tubules are made up of proteins called-----
9. Mitosis provides equilibrium in the amount of-----and -----in the cell.
10. Chorosomes are shortest and thickest at -----phase.

Section B

Answer all

(5\*6=30)

11. a) give a detailed account of nucleic acid present in cells?

(or)

b) What are the chemical bonds present in Biomolecules?

12.a) draw a neat labeled diagram of mitochondria and discuss its features

(or)

b) Give a detailed account of nuclear components with diagram

13.a) explain heterochromatin &amp; polytene chromosome

(or)

b) Describe the features of crossing over taking place in homologous Chromosome?

14. a) what is cell-cell signaling?

or

b) Give a detailed account of microtubules in cells with diagram.

15.a) what is photosynthesis and explain about the sit of the synthesis?

or

b) What is endoplasmic reticulum? Explain with diagram.

Section C

Answer all

(5x12=60)

16. a) Discuss about cell cycle?

or

b) Describe the characteristic features of cancer.

17. a) highlight the importance of B lymphocytes in human body?

(or)

b) Discuss how protein synthesis occurs in cell?

18. a) difference between prokaryotic and eukaryotic cell?

(or)

b) Discuss on development of cell theory?

19. a) explain: i) Proteins ii) carbohydrates iii) lipid

(or)

b) Give a detailed account of red blood cells?

20. a) what is immunity and explain the term with lymphocytes in blood

(or)

b) What is Apoptosis and how it is related to cell functioning?

**Semester I**

**Core paper II**

**BIODIVERSITY**

Duration 3 hrs

Marks 100

SECTION: A.

ANSWER ALL

(10 x 1 =10)

1. Variation of Genes within population or within species-----
2. ....can be defined as mating of individuals related by common ancestry
3. When the new species evolves in geographic isolation from the parent species is called .....
4. ....represents the value of the future information made available through the preservation of a resource
5. The process involving energy transformation will not occur spontaneously unless there is degradation of energy is called .....
6. Diatomic
7. Succession
8. Nitrogen cycle
9. Buoyancy
10. Biodegradation

Section B

answer all

(5 x 6 = 30)

11 a) Give an account of global diversity

or

b) Write a note on loss of biodiversity



12 a) Theories of biological classification

or

b) Write a note on conservation strategies

13 a) Write about classification of bryophytes

or

b) Write about economic importance of lichens

14 a) Write short notes on i) Energy flow, ii) food chain, iii) food web

or

b) Write a note on speciation

15 a) Give an account on physio-chemical properties of water

or

b) Write about biodegradation in ecosystem

Section C

Answer All

(5 x 12 = 60)

16 a) Define: biodiversity. Explain the different types of biodiversity.

or

b) Write notes on Western Ghats

17 a) Write the methods of DNA finger printing

or

b) Write about economic values of biodiversity

18 a) Give broad outlines of classification of Fungi

or

b) Write about Economic importance of Fungi

19 a) Write about interaction between environment and biota

or

b) Explain about Nitrogen and Sulphur cycle

20 a) Write about impact of environmental factors on aquatic biota

or

b) Give an account on mineral cycle of ecosystem.

**Semester II**  
**Core paper III**                      **BIOCHEMISTRY**

MODEL QUESTION PAPER

TIME: 3 HOURS

MAX. MARKS: 100

## SECTION A

(10 X 1 = 10)

CHOOSE THE BEST ANSWER

1. The end of hydrolysis of starch by amylase is  
(a) soluble starch                      (b) glucose  
(c) dextrans                              (d) maltose
2. The following carbohydrate is called animal starch  
(a) glucose                                (b) fructose  
(c) sucrose                                (d) glycogen
3. Iodine of an oil shows the extent of  
(a) polymerization                      (b) unsaturation  
(c) molecular size                        (d) estrification
4. One of the following is an unsaturated fatty acid  
(a) arachidonic acid                      (b) palmitic acid  
(c) stearic acid                            (d) acetic acid
5. Maximum enzyme activity is observed at  
(a) acidic p H                              (b) neutral pH  
(c) basic p H                                (d) optimum p H
6. The following reaction is characteristic of what type of enzymes  
$$2 \text{H}_2 \text{O} \longrightarrow 2 \text{H}_2 \text{O} + \text{O}_2$$
  
(a) Peroxidases                            (b) catalases  
(c) dehydrogenases                        (d) copper containing oxidases
7. Which among the following is a basic amino acid  
(a) asparagine                              (b) arginine  
(c) proline                                 (d) alanine
8. Flavoprotein contains  
(a) riboflavin                                (b) thiamine  
(c) niacin                                    (d) pyridoxin
9. A nucleoside is a mixture of -----  
(a) base + ribose                            (b) base + ribose + phosphoric acid  
(c) base + phosphoric acid                (d) ribose + phosphoric acid
10. Protein synthesis is called  
(a) Replication                              (b) transcription  
(c) Translation                              (d) termination

## SECTION B

(5 X 6 = 30)

ANSWER ALL QUESTIONS, CHOOSING EITHER (a) OR (b)

11. (a) Explain the structure of sucrose and their properties.  
Or  
(b) Briefly describe about the classification of carbohydrate.
12. (a) what is PUFA? What are their roles in living system?  
Or  
(b) Explain  $\beta$  oxidation of fatty acids.
13. (a) differentiate co enzymes and cofactors with an example.  
Or  
(b) Derived line weaver Burke equation.
14. (a) give an account of the classification of amino acids.  
Or  
(b) Write short on zwitter ionic properties of amino acids.
15. (a) describe genetic code with a suitable example .  
Or  
(b) With a suitable diagram explain the structure and properties of t - RNA.

## SECTION C

(5 X 12 = 60)

ANSWER ALL QUESTIONS, CHOOSING EITHER (a) OR (b)

16. (a) Give an detailed account on the structure and the properties of starch.  
Or  
(b) Describe the synthesis of purine and pyrimidines .
17. (a) What are saturated and unsaturated and describe about the biosynthesis of fatty acids .  
Or  
(b) Discuss about the degradation of lipids by alpha , beta and omega oxidation.
18. (a) what are the various factors which influence the enzyme activity.  
Or  
(b) Derived michelis – manton equation and the transfor4mation of minchel – menton kinetics , line weaver burke plot?
19. (a) Give an detailed account on the structures and properties of amino acids and write a note on zwitter ionic properties .  
Or  
(b) Describe the different structures of protein and amino acids sequencing of protein
- .20. (a) Describe the structures of DNA and explain the biosyntheis pathway of purine and pyrimidine.  
Or  
(b) Give a detailed account on transcription process.

**Semester III**  
**Core paper IV      MICROBIOLOGY**

TIME: 3 HOURS

MARKS: 100

SECTION - A (10 x 1 =10 MARKS)

Define the following

1. TEM
2. Oogamy
3. Sterilant
4. Nutrient Agar
5. Resolution
6. The penicillin antibiotic is produced by -----
7. Ethyl Alcohol is produced by -----
8. N<sub>2</sub> fixation is an example for -----
9. β-oxidation is the general path way for-----metabolism
10. Blood Agar media is an example for -----media

SECTION - B (5 X 6 = 30 MARKS)

11 a) Write short notes on various types of light microscopes

or

b) Write a general account of microbial diversity

12 a) Write short notes on general structure of Bacteria

or

b) Explain the Economic importance of Yeasts and Moulds

13 a) Write a note on chemoautotrophs

or

b) Write about Symbiosis.

14 a) Write about the different types of media

or

b) Write short notes on different types staining techniques.

15 a) Explain fixation of Nitrogen

or

b) Explain about Fermentation.

SECTION - C (5 X12 = 60 marks)

16 a) Describe about the different types of electron microscopes.

or

b) Write about the definition and scope of Microbiology.

- 17 a) Describe about the growth and reproduction of fungi.  
or  
b) Write an essay on growth and reproduction in viruses.
- 18 a) Write about the microbial pathogens of plants.  
or  
b) Write an essay on microbial pathogens of animals and humans
- 19 a) Write explanatory notes on different methods of chemical sterilization  
or  
b) Describe the structure and composition of bacterial cell wall.
- 20 a) Write about Carbon and Phosphorous cycle.  
or  
b) Write an essay on production of enzymes and antibiotics.

**Semester III**  
**Core Paper V          GENETICS**

TIME: 3 HOURS

MARKS: 100

SECTION- A (10 x 1 =10 MARKS)

Define the following

1. Col plasmid
2. Transposons
3. Hardy-Weinberg's law
4. Genetic counseling
5. Chromosomal aberrations
6. The pink flower color of 4'o clock plant is an example for the phenomenon of -----
7. The Epistatic ratio is -----
8. IS elements is an example of -----
9. The unit of recombination in a gene is called-----
10. ----- is the genetic material.

SECTION - (5 X 6 = 30 MARKS)

- 11 a) Write short notes on Independent Assortment  
or  
b) Explain about the Incomplete dominance
- 12 a) Write short notes on Epistasis  
or  
b) Explain lethal genes and lethality
- 13 a) Write a note on chromosomal variation in number  
or  
b) Explain genetics of hemoglobin

14 a) Write about the fine structure of gene.

or

b) Write short notes on Experimental evidence for DNA as the genetic material

15 a) Explain Genetic counseling

or

b) Explain about the genetic drift

**SECTION - C**

(5 X 12 = 60 marks)

16 a) Describe about the chromosomal theory of inheritance

or

b) Describe about the sex determination mechanism in animals

17 a) Describe about the Mendelian principles

or

b) Write an essay on Multiple allelism

18 a) Write about the Transposable elements in prokaryotes

or

b) Write an essay on chromosomal aberrations

19 a) Write explanatory notes on relation between genes and polypeptides

or

b) Describe the F, Col and R plasmids in bacteria

20 a) Write about regulation of development in Arabidopsis

or

b) Write an essay on Factors affecting gene frequency

**Semester III**  
**Diploma Paper I Human Physiology**  
**Model Question Paper**

TIME: 3 HOURS

MARKS: 100

Section A:

Answer All

(10 \* 1 =10)

Define the following:

1. Myosin
2. Acetyl choline
3. Rhodopsin
4. Coklea
5. Stem cell
6. Plasminogen
7. Lymph node
8. Assimilation
9. Threshold level
10. Adrenaline

Section B: Answer all (5 \* 6 = 30)

- 11a) Write a brief note on muscle contraction  
or  
b) With figures -Discuss the muscle types
- 12 a) With diagram discuss the structure of Ear  
or  
b) Discuss blood clotting
- 13 a) Discuss the functions of Heart  
or  
b) Discuss P<sup>H</sup> maintenance in the blood system
- 14 a) Discuss lymphatic system with diagrams  
or  
b) With neat diagram explain the digestive system
- 15 a) Discuss the types of Hormones  
or  
b) Discuss the functions of insulin

Section C: Answer all (5 \* 12 = 60)

- 16 a) Explain neuro – muscular junction  
or  
b) Explain how signals are conducted in neurons.
- 17 a) Explain the functions of Brain  
or  
b) Discuss erythropoiesis
- 18 a) Discuss ECG  
or  
b) Discuss gas exchange in the respiratory system
- 19 a) Discuss the absorption of carbohydrates in digestive system  
or  
b) Discuss the functions of Kidney
- 20 a) Discuss the functions of hypothalamus  
or  
b) Discuss the hormonal regulations of metabolism





12. (a) Comment on biological database protocol.  
Or  
(b) Give a note on pathway database.
13. (a) What do you know about EST.  
Or  
(b) Give an account on SAGE.
14. (a) Explain protein – protein interaction.  
Or  
(b) Describe mass spectrometry.
15. (a) Comment on drug designing .  
Or  
(b) Explain chemoinformatics.

SECTION C

(5 X 12 = 60)

ANSWER ALL QUESTIONS, CHOOSING EITHER (a) OR (b)

16. (a) Discuss about electronic mail.  
Or  
(b) Write an essay on search engine.
17. (a) Write an essay on sequence analysis tools.  
Or  
(b) Write an essay on primary nucleic acid sequence database.
18. (a) Discuss DNA and RNA microarrays.  
Or  
(b) Explain in brief the different method used in human genome mapping.
19. (a) Discuss about 2 D gel electrophoresis.  
Or  
(b) Comment on pathway analysis .
20. (a) Explain phylogenetic analysis .  
Or  
(b) Write a note on the following.  
(1) Pearl (2) E – cell.

**Semester IV**  
**DIPLOMA PAPER II: HUMAN PATHOLOGY**

TIME: 3 HOURS

MARKS: 100

SECTION - A (10 x 1 =10 MARKS)

1. Cirrhosis
2. Rotor drugs
3. Cystic fibrosis
4. Ketotic Hyperglycemic
5. Creatine kinase

6. ----- Hormone helps in detection of pregnancy
7. Myocardial infraction refers to-----
8. Proteinuria means-----
9. Acromegaly results because of-----
10. Jaundice is an example of-----

SECTION - B (5 X 6 = 30 MARKS)

11. a. Write short note on disorders of kidney  
Or  
b. Write about biotechnological approaches to treatment of liver diseases.
12. a. Write short note on Disorders of carbohydrate metabolism.  
Or  
b. Write about the significance of Diabetes in pregnancy.
13. a. Write briefly about metabolic aspects of cancer  
Or  
b. Write short note on enzymes which serve as tumor markers
14. a. Explain disorders of hypothalamus  
Or  
b. Write about the Prostate cancer markers.
15. a. Explain disorders of plasma proteins  
Or  
b. Write briefly about Abnormal Haemoglobin derivatives.

SECTION- C (5 X 12 = 60 Marks)

16. a. Write elaborately on inherited abnormalities of bilirubin metabolism  
or  
b. Write an essay on Thyroid related deficiencies
17. a. Write about metabolic complication of diabetes  
or  
b. Write elaborately on diagnosis and management of diabetes.
18. a. Add a significant note on disorders of adrenal medulla  
or  
b. Explain the disorders on Adrenal Cortex.
19. a. Write about biotechnological approaches to liver diseases especially in development of vaccines and drugs.  
Or  
b. Write an essay on the relationship of liver and alcohol





b. Explain Mutation

12a. How will you produce virus free plants?

Or

b. Give a brief account on somaclonal variation:-

13a. What do you mean by gene family? Add a brief note on it:-

or

b. Explain briefly how the proteins are targeted to the chloroplast?

14a. Give a brief note on the nif genes:-

or

b. Write a brief account on the opines and its importance:-

15a. how plantibodies are produced?

Or

b. Write brief notes on selectable markers

### SECTION C

(5X12 =60)

16a. Write an essay about polyploidy in crop improvement:-

or

b. Write a detailed account on the backcrossing technique and its application in crop improvement

17a. Give a detailed account on the somatic hybridization and its application in crop improvement:-

or

b. Write an essay on the various methods of sterilization in plant tissue culture:-

18a. Cytoplasmic Male sterility & its application – Discuss.

Or

b. Explain in detail about the Chloroplast genome organization:-

19a. How will you produce transgenic plants?

Or

b. Explain the various physical methods of gene transfer in plants

20a. Describe in detail on the herbicide resistance transgenic plants:-

or

b. write a detailed account on the pest resistance transgenic plants

**Semester V**  
**Core Paper IX : ANIMAL BIOTECHNOLOGY**

MODEL QUESTION PAPER

TIME: 3 HOURS

MAX. MARKS: 100

## SECTION A

(10 X 1 = 10)

CHOOSE THE BEST ANSWER

1. ----- refers to the culture of dispersed cells obtained from original tissue or from a cell Line
  - (a) Cell culture
  - (b) cell line
  - (c) Both (a) & (b)
  - (d) none of the above
2. ----- refers to the irrerversible loss of specialized properties of cells when they are cultured invitro
  - (a) Dedifferentiation
  - (b) redifferentiation
  - (c) Differentiation
  - (d) none of the above
3. The end of the proliferate life span of cells is refers to as
  - (a) Senescence
  - (b) apoptosis
  - (c) Cell line
  - (d) none of the above
4. The process of programmed cell death is refers to as
  - (a) Senescence
  - (b) apoptosis
  - (c) Both (a) & (b)
  - (d) none of the above
5. Vaccine are
  - (a) Dead bacteria
  - (b) attenuated bacteria
  - (c) Viral fragments
  - (d) all of the above
6. Treatment of disease by use of gene or DNA sequences
  - (a) Gene therapy
  - (b) genetic immunization
  - (c) Gene silencing
  - (d) none of the above
7. Cryopreservation broadly means the storage of germ plasm
  - (a) Over solid CO<sub>2</sub> ( at -79 ° C)
  - (b) low temperature deep freezers at ( at -80 ° C)
  - (c) In liquid nitrogen ( at -196 ° C)
  - (d) all of the above
8. Application of embryo culture
  - (a) Prevention embryo abortion
  - (b) overcoming seed darmency
  - (c) Production of haploids
  - (d) All of the above
9. The target gene responsible for the development of transgenic organisms.
  - (a) Transgene
  - (b) transgenic
  - (c) Both (a) & (b)
  - (d) none of the above
10. The first animals used for transgenic was a
  - (a) Mouse
  - (b) goat
  - (c) Dog
  - (d) horse

## SECTION B

(5 X 6 = 30)

ANSWER ALL QUESTIONS, CHOOSING EITHER (a) OR (b)

11. (a) Write short notes on characterization of cultured cells.  
Or  
(b) Comment on animal cell culture media.
12. (a) Give a note on primary cell culture.  
Or  
(b) Write an account on cell growth kinetics.
13. (a) Explain electrophoration.  
Or  
(b) Explain in brief on gene therapy.
14. (a) Explain the molecular events during fertilization..  
Or  
(b) Write in brief about cytokines.
15. (a) Write in detail about embryo culture.  
Or  
(b) Give a note on blood clotting factors.

SECTION C (5 X 12 = 60)

ANSWER ALL QUESTIONS , CHOOSING EITHER (a) OR (b)

16. (a) What are the facilities required to set up animal cell culture laboratory.  
Or  
(b) Comment on cell synchronization and senescence.
17. (a) Write an essay on stem cell culture.  
Or  
(b) Write an essay on crypreservation.
18. (a) comment on human genome project. Add a note on major highlights of human Genome.  
Or  
(b) Write an essay on vaccine.
19. (a) explain the genetic regulation during embryonic development.  
Or  
(b) Briefly explain collection and preservation of embryo.
20. (a) write an essay on transgenics and their applications .  
Or  
(b) Write short note on the following.  
(1) Hormone  
(2) Plasminogen

**Semester V**

**(AOS-A)- Paper I**

**MOLECULAR GENETICS**

DURATION: 3 HRS

MAX MARKS: 75

**SECTION A**

(10X1 =10)

1. DNA helicase
2. One complete set of DNA is called as  
a) haploid    b)diploid    c) genome    d) none
3. Explain genetic code
4. Explain operon
5. Transit peptide
6. Translation
7. The resultant organism from mutation is called  
a) Mutant   b) mutation   c) mutagen    d) all of these
8. What do you mean by Linkage?
9. The material which induces mutation is termed as  
a) Mutant   b) mutation   c) mutagen    d) all of these
10. Explain gene knockout

**SECTION B**

Answer all

(5X5 =25)

11a. Comment on the semi-conservative type of DNA replication:-

or

b. Describe the structure of tRNA with illustration:

12a. Elaborate the rho dependent termination of transcription:-

or

b.: Write a brief account on 'Genetic code':-

13a. Protein export – Discuss

or

b. Discuss RNA Processing

14 a. Explain briefly photoreactivation:-

or

b. Give a brief account on 'Induced mutation' :-

15a. Explain briefly the transformation:-

or

b. Write a brief account on gene targeting:-

**SECTION C**

Answer all

(5X8 =40)

16a. Write a detailed account on Organisation of genome:-

or

b. DNA as genetic material – Discuss:-



17a. Give a detailed account on lac operon:-

or

b. Write a detailed account on the 'Elucidation of genetic code':-

18a. Explain protein synthesis in detail :-

or

b. Give a detailed account on the post translational modifications:-

19a. Elaborate the Ames test :-

or

b. Comment on the spontaneous mutations:-

20a. Write a detailed account on conjugation:-

or

b. Elucidate the various steps involved in chromosome mapping:-

**(AOS\_A) Paper II**                      **Semester V**  
**BIOLOGY OF CLONING VECTORS**

DURATION : 3 HRS

MAX MARKS : 75

SECTION A                                      (10X1 =10)

1. episome
2. vector
3. cosmid
4. concatamers
5. Yip
6. Lysate
7. probe
8. FISH
9. cDNA Library
10. Magic Box

SECTION B                                      (5X5 =25)

11a. Describe the structure of plasmid pUC 18:-

or

b. Discuss Construction of PBR 322

12a. Explain briefly on M13 vector:-

or

b. Explain cosmid and its importance in rDNA technology

13a. Explain Yip:-

or

b. Write a brief account on the cloning in Bacillus:-

14a. How will you produce a cDNA ?

or

b. Explain chromosome walking:-

15a. How will you check the safety of a rDNA laboratory?

or

b. Discuss Clinical applications of rDNA technology

**SECTION C**

(5X8 =40)

16a. Write a detailed account on the pBR 322 and its importance in rDNA technology:-

or

b. Expression vectors in prokaryotes – Explain

17a. Write a detailed account on SV40 viral vector:-

or

b. Give a detailed account on Ti plasmids:-

18a. Explain YAC

or

b. Cloning in streptomyces – Discuss

19a. How will you construct a genomic library?

or

b. Comment on the site directed mutagenesis:-

20a. Give a detailed account on Human Genome project:-

or

b. Write a detailed account on the gene therapy:-

**Semester V**

**Diploma paper III: Diagnostic tools**

Duration 3 hrs

Marks 100

**SECTION – A**

10 x 1 = 10

Answer all

1. Serum
2. Coagulation
3. Eosinophil
4. Nephron
5. Dialysis
6. Aciduria
7. threshold level
8. graft
9. PPLO
10. Radio immuno assay

**Section B**

Answer all

5 \* 6 = 30

11 a) what do you mean by packed cell volume?

or

b) Discuss Anemia

12 a) Discuss differential counting

or

b) Discuss the functions of Basophiles

13 a) Discuss the physical analysis of urine

or

b) Discuss absorption and re-absorption in Kidney

14 a) Discuss the functions of blood

or

b) Discuss the types of grafts

15 a) Write a brief note on Lymphocytes

or

b) Discuss the clinical applications of PCR

Section C:

Answer all

5 \* 12 = 60

16 a) Explain the biochemistry of blood coagulation

or

b) Discuss the types of Blood cells with diagrams.

17 a) Explain the importance of urine analysis during infection.

or

b) Explain the extraction and analysis of CSF

18 a) Discuss Haemoglobinopathies

or

b) Discuss ELISA

19 a) Discuss the methods in Blood banking

or

b) Discuss the mechanism of Graft rejection

20 a) Discuss the examination of AIDS and its importance.

or

b) How the computers can be useful in a clinical laboratory on

**Semester VI**  
**Core Paper X      MICROBIAL BIOTECHNOLOGY**

Duration 3 hrs

Marks 100

SECTION – A

10 x 1 = 10

Answer all

1. Microbe
2. Organic acid
3. Vaccine
4. Lipase
5. Fermentation
6. Lactic acid bacteria
7. Glutamine
8. Tetracycline
9. Xenobiotic
10. Biofertiliser

SECTION – B

5 x 6 = 30

Answer all

11. a) Briefly note on the horizons of microbial biotechnology  
(or)  
b) Give an account on the applications of microbial biotechnology
12. a) Briefly note on synthetic vaccines  
(or)  
b) Give short notes on production of proteins in yeast
13. a) Explain the production of ethanol from feed stock  
(or)  
b) Give a protocol for the production of lactic acid
14. a) Briefly note on antifungal agents  
(or)  
b) Give a short note on antitumour antibodies
15. a) Describe the role of microbes in removal of heavy metals from effluents  
(or)  
b) Give a brief note on nitrogen fixing bacteria

SECTION – C

5 X 12 = 60

Answer all

16. a) Scope of microbial biotechnology – Comment on it

- (or)
- b) Give a detailed note on the public concerns of microbial biotechnology
17. a) Microbes are living factories of macromolecules - Explain  
(or)  
b) Explain with an example Microbial Insecticides
18. a) Acetic acid production  
(or)  
b) Describe about the industrial production of various diary products
19. a) Describe in detail the production of aminoacids  
(or)  
b) Discuss the large scale production of antibiotics
20. a) Explain the role of microbes in xenobiotics degradation  
(or)  
b) Discuss about the production of SCP with an example

**Core Paper XI****Semester VI  
ENVIRONMENTAL BIOTECHNOLOGY**

TIME: 3 HOURS

MARKS: 100

**SECTION - A (10 x 1 =10 MARKS)**

1. Global Warming
2. Chipko movement
3. Gene Bank
4. Antagonism
5. Food web
6. Acid rains refers to-----
7. Cryopreservation is-----
8. Trophic level refers to-----
9. FAO is -----
10. The word Pollution refers to-----

**SECTION- B****(5 X 6 = 30 MARKS)**

11. a. Write about the biotic factors that affect ecology  
or  
b. Write briefly about Symbiosis
12. a. Write about the pond ecosystem.

Or

- b. Explain the pyramid of biomass
13. a. Write about the role of domestic live stock  
or  
b. Add a note on ethical and aesthetic values of biodiversity.
14. a. Write about Air pollution  
or  
b. Add significantly on water pollution
15. a. Explain briefly about National park  
or  
b. Explain briefly about Chipko movement

SECTION - C (5 X 12 = 60 Marks)

16. a. Add a significant note on parasitism and predation  
or  
b. Explain the role of Abiotic factors affecting ecology.
17. a. Explain the Biogeochemical cycle of N & P.  
or  
b. Write short note on a. Food web  
b. Food chain  
c. Energy Flow
18. a. Explain ozone and its importance  
or  
b. Write an essay on Environmental Assessment and monitoring systems.
19. a. Explain the plant Bioresources.  
Or  
b. Write an essay on intellectual property Rights.
20. a. Write in detail about In-situ and Ex-situ conservation Strategies.  
Or  
b. Write an essay on wild life Sanctuaries

**Semester VI**

**(AOS B) Paper I: RECOMBINANT DNA TECHNOLOGY AND BIO ETHICS**

MODEL QUESTION PAPER

TIME: 3 HOURS

MAX. MARKS: 75

SECTION A

(10 X 1 = 10)

CHOOSE THE BEST ANSWER

1. ECO R1 restriction site is
  - (a) GAATTC
  - (b) GG CC
  - (c) CCGG
  - (d) GGCCGG
2. The main sources of DNA ligase is
  - (a) Ø x 174
  - (b) E.coli
  - (c) T 4 phage
  - (d) neurospora
3. Protein engineering is carried out by
  - (a) site directed mutagenesis
  - (b) Laser beam
  - (c) gamma radiation
  - (d) dimmer formation
4. Which of the following is used as probe
  - (a) single stranded DNA
  - (b) Double stranded DNA
  - (c) both (a) & (b)
  - (d) none of the above
5. Transduction is mediated by
  - (a) phages
  - (b) bacteria
  - (c) both (a) & (b)
  - (d) none of the above
6. Which of the following technique is used for direct DNA transfer
  - (a) particle gun
  - (b) transformation
  - (c) translation
  - (d) none of the above
7. Antibody is used as probe in
  - (a) northern blotting
  - (b) southern blotting
  - (c) western blotting
  - (d) none of the above
8. Southern blotting technique is developed by
  - (a) southern
  - (b) korn berg
  - (c) craig venter
  - (d) All of the above
9. ----- discovered polymerase chain reaction.
  - (a) kary mullis
  - (b) francis collins
  - (c) southern
  - (d) korn berg
- 10 DBT is located at
  - (a) new delhi
  - (b) bombay
  - (c) culcutta
  - (d) hydrabad

## SECTION B

(5 X 5 = 25)

ANSWER ALL QUESTIONS, CHOOSING EITHER (a) OR (b)

11. (a) Write short notes on poly nucleotide kinase.  
Or  
(b) Write a brief note on the nomenclature of restriction enzymes.
12. (a) Comment on genomic library.  
Or  
(b) Write an account on probe construction.
13. (a) Explain transformation.  
Or  
(b) Explain in brief particle gun bombardment.
14. (a) Give a note on ' antisense technology'..  
Or

- (b) Describe in brief about terminator gene technology.
15. (a) Write in detail about biosafety management.  
Or  
(b) Write in detail about issues in biotechnology.

SECTION C

(5 X 8 = 40)

ANSWER ALL QUESTIONS, CHOOSING EITHER (a) OR (b)

16. (a) Write an essay on DNA manipulative enzymes.  
Or  
(b) Write an essay on restriction and modification systems of bacteria.
17. (a) Explain the construction of DNA libraries.  
Or  
(b) Write an essay on protein engineering.
18. (a) Write a note on the following.  
(1) Electroporation  
(2) Liposome mediated transfer.  
Or  
(b) Write an essay on co - cultivation.
19. (a) Discuss about southern transfer technique.  
Or  
(b) Write about DNA sequencing methods.
20. (a) Write an essay on social and ethical issues of biotechnology .  
Or  
(b) Give your view about biotechnology and hunger.

(AOS \_ B) Paper II

**Semester VI**  
**BIOPHYSICS AND BIOINSTRUMENTATION**

Duration 3hrs  
SECTION – A

Marks 75  
10 x 1 = 10

Answer all

1. Nucleoside
2. Secondary structure of protein
3. Covalent bond
4. Ionic interaction
5. Beer – Lambert’s law
6. X – ray diffraction
7. Ninhydrin
8. HPLC
9. Sedimentation
10. Agarose



## SECTION – B

5 x 5 = 25

Answer all

11. a) Briefly describe the primary structure of proteins  
(or)  
b) Give the structure and bond formation of (i) Adenine and (ii) Thymine
12. a) Give a short note on Van der Waal's interaction  
(or)  
b) Write briefly about Ionic interactions
13. a) Explain Beer – Lambert's law  
(or)  
b) Comment of X- ray scattering
14. a) Gel Filtration chromatography – Comment on it  
(or)  
b) Give notes on thin layer chromatography
15. a) Write notes on agarose gel electrophoresis  
(or)  
b) Give short notes on Ultracentrifugation

## SECTION – C

5 X 8 = 40

Answer all

16. a) Give a detailed note on the protein structure  
(or)  
b) Describe in detail the structure of nucleic acid
17. a) Discuss about the forces that stabilize the protein structure  
(or)  
b) Describe the forces that stabilize nucleic acid structure
18. a) Explain the principle and working of NMR spectroscopy  
(or)  
b) Explain the principle and working of Mass spectroscopy
19. a) Write notes on (i) HPLC (ii) GC  
(or)  
b) Give a detailed on affinity chromatography
20. a) Give a detailed note on SDS- PAGE  
(or)  
b) Explain the methods of (i) Diffusion (ii) Sedimentation

**Semester VI**  
**Diploma Paper IV: PHARMACOLOGY**

MODEL QUESTION PAPER

TIME: 3 HOURS

MAX. MARKS: 100

SECTION A

(10 X 1 = 10)

CHOOSE THE BEST ANSWER

1. The study of mechanism of action and action of drug is called
  - (a) pharmaco kinetics
  - (b) pharmaco vigilance
  - (c) pharmaco economics
  - (d) pharmaco dynamics
2. Receptor serves as
  - (a) Recognition molecule
  - (b) signal transmission
  - (c) both (a) & (b)
  - (d) none of the above
3. Which of the following is favouring maximum absorption?
  - (a) Digoxin
  - (b) Digitoxin
  - (c) Both (a) & (b)
  - (d) none of the above
4. Which of the following are involved as primary drug target?
  - (a) Enzymes
  - (b) receptors
  - (c) Ion channels
  - (d) all of the above
5. The uses of bioassay
  - (a) to measure drug toxicity and unwanted effects
  - (b) to investigate the function of endogenous mediators
  - (c) both (a) & (b)
  - (d) none of the above
6. The main routes of drug administration
  - (a) Oral
  - (b) sublingual
  - (c) Rectal
  - (d) all of the above
7. Penicillin G act by
  - (a) Inhibit protein synthesis
  - (b) remove intracellular calcium
  - (c) Inhibit DNA synthesis
  - (d) inhibit cell wall synthesis
8. Hormone insulin is secreted from
  - (a)  $\beta$ - islet cells of pancreas
  - (b)  $\alpha$ - islet cells of pancreas
  - (c)  $\gamma$ - islet cells of pancreas
  - (d)  $\delta$ - islet cells of pancreas
9. Sulfonamides act by
  - (a) Inhibiting cell wall synthesis
  - (b) inhibiting protein synthesis
  - (c) Inhibiting folate synthesis
  - (d) inhibiting DNA gyrase
10. Drug which induce cancer are called
  - (a) Teratogenic agents
  - (b) hypersensitive drugs
  - (c) carcinogenic drugs
  - (d) ototoxic drugs

SECTION B

(5 X 6 = 30)

ANSWER ALL QUESTIONS, CHOOSING EITHER (a) OR (b)

11. (a) Explain phase I and phase II reactions of drug metabolism in detail.  
Or  
(b) Discuss the design of pro drug.
12. (a) Discuss the role of human hepatic cytochrome P 450 enzyme system in drug metabolism  
Or  
(b) Discuss various novel drug delivery systems.
13. (a) Discuss the theories of drug receptor interaction .  
Or  
(b) Describe the various methods of bioassay.
14. (a) Describe the structure of G protein coupled receptor and discuss the role protein  
Or  
(b) Write short on tachyphylaxis.
15. (a) Write an essay on the sulfonamide .  
Or  
(b) Write an essay on drug dependence.

SECTION C

(5 X 12 = 60)

ANSWER ALL QUESTIONS, CHOOSING EITHER (a) OR (b)

16. (a) Discuss the various process of drug absorption and factors affecting the absorption.  
Or  
(b) Discuss the factors modifying the effect of drugs
17. (a) Discuss the factors which affect the drug action .  
Or  
(b) Explain in detail about the excretion of drugs.
18. (a) Discuss the factors which affect the drug action.  
Or  
(b) Explain in detail about the excretion of drugs.
19. (a) discuss the mechanism and uses of various penicillin.  
Or  
(b) Discuss the drug treatment of diabetes mellitus.
20. (a) write an essay on cancer chemotherapy .  
Or  
(b) Comment on anti fertility and ovulation inducing drugs.