

BIOCHEMISTRY

Unit I :

Introduction to Biochemistry;

Amino acids & proteins : Structure and function, structure and properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape. Different level of structural organization of proteins, protein purification and renaturation of proteins : Fibrous and globular proteins.

Carbohydrates : Structure, function and properties of monosaccharides, Disaccharides and polysaccharides, Homo & Hetero polysaccharides, Mucopolysaccharides, Bacterial cell wall, Glycoproteins and their biological function.

Unit II

Lipids : Structure and function, classification, nomenclature and properties of fatty acids, essential fatty acids, phospholipids, glycolipids, cerebrosides, cholesterol.

Nucleic acid : Structure and functions : physical and chemical properties of Nucleic acids, Nucleosides, Nucleotides, purines, pyrimidines, Biologically important nucleotides, Double helical model of DNA structure and forces responsible for A, B & Z DNA, denaturation and renaturation of DNA.

Unit III : Enzymes : Introduction, classification & nomenclature of enzymes, role of enzymes in biosynthetic and degradative cellular functions, mechanism and mode of action of enzymes, inhibition and regulation of enzyme action, enzyme kinetics, In vitro activity of purified enzymes and their applications in industry. Various uses of enzymes in food processing, medicines, diagnostics and production of new compounds Enzymes as research tools- ELISA methods, modification of biological compounds with the help of enzyme.

Unit IV

Carbohydrate Metabolism : Reactions, energetics and regulation, Glycolysis Fate of pyruvate under aerobic and anaerobic conditions. Pentose phosphate pathway and its significance, TCA cycle, Electron transport Chain, Oxidative phosphorylation, Gluconeogenesis, Glycogenolysis and glycogen synthesis, β -oxidation of fatty acids.

In all 8 questions are to be set as follows :

- | | |
|--|--------------------------|
| Q1. Compulsory questions multiple choice questions covering the entire syllabus | 10 X 1.5 = 15 Marks |
| Q2. Compulsory questions 4 Short answer questions covering the entire syllabus | 4 X 5 = 20 Marks |
| Q3. 3 to 8 long answered questions in two groups covering the entire syllabus, three to be answered at least one must be from each group | 3 X 15 = 45 Marks |
| | <u>Total = 80 Marks</u> |
| Two Internal Assessment of ten marks each | 2 X 10 = 20 Marks |
| | <u>Total = 100 Marks</u> |

Group A

MATHEMATICS : II

- Unit 1 - The set theory; properties of subsets, Linear and geometric functions. Limits and derivatives of functions. The binomial theorem, Logarithm, solution of Linear Equations.
- Unit 2 - Differentiation & integration; matrices probability classical & axiomatic definition of probability, probability calculation, method of sampling, confidence level, Measurement of central tendencies and deviations.

Group B

Practical Computers :

- Unit III - General introduction to computers and its function; different components of computers; Basic design of computers. Classification of computers; digital and analogue computers, Mini, Micro, Main frame & super computers/Programming Logic & Design techniques- Algorithm Flow charts and Pseudocodes.
- Unit IV - Computers in online monitoring and automation. Internet, Platform of internets, ~~http~~, URL, TCP/IP protocol, Ip-adress
Application of computers in coordination of solute concentration, pH and temperature etc of a fermenter in operation.
Demonstration of the above utilities (along with above lectures)

Time 3hrs

In all 8 questions are to be set as follows :

- | | |
|---|---------------------|
| (Q1). Compulsory questions multiple choice questions covering the entire syllabus | 10 X 1.5 = 15 Marks |
| (Q2). Compulsory questions 4 Short answer questions covering the entire syllabus | 4 X 5 = 20 Marks |
| (Q3. to 8 long answered questions covering the entire syllabus, three to be answered. | 3 X 15 = 45 Marks |
| | Total = 80 Marks |
| Two Internal Assessment of ten marks each | 2 X 10 = 20 Marks |
| | Total = 100 Marks |

CELL BIOLOGY III

- Unit 1 - Introduction to modern tools and techniques of cell biology optical, SEM, TEM. An introduction to cell biology, cell as basic unit of living systems, The cell theory, modern cell biology, Procellular evolution, artificial creation of cells.
- Unit 2 - Diversity of cell size and shape : structure of prokaryotic cells (bacteria, Virus, Cyanobacteria, mycoplasma, eukaryotic microbes, plant and animal cells.) A detailed classification of cell types within an organism, cell, tissue, organ and organism as different levels of organization of otherwise genetically similar cells, Biochemical composition of cells (Proteins, lipids, carbohydrate, nucleic acid and the metabolic pool)
- Unit 3 - Organization of cell : Cell wall, cell membrane, ultrastructure and function of cell membrane, cytosol cell recognition and membrane transport, structure & function of membrane bound cell organelles nucleus (nuclear membrane, nucleolus nucleoplasm) Golgi bodies (structure, function including role in protein synthesis), Endoplasmic reticulum structure function including role in protein segregation, mitochondria chloroplast, lysosome, peroxisome, vacuoles, and microbodies, non membrane bound cell organelles, ribosome, cytoskeleton and cell motility microtubules intermediate filaments and microfilaments.
- Unit IV - Cell growth and division : Cell cycle, Kinds of cell division, amitosis, mitosis, meiosis, crossing over, significance of cell

division. Cell locomotion (amoeboid flagellar, ciliar) muscle and nerve cells, cell senescence and death, cell differentiation in plant & animals.

Cancer : Carcinogenesis, agents promoting carcinogenesis, characteristics and molecular basis of cancer. ✓

Paper-4

Time 3hrs

Maximum Marks 80

In all 8 questions are to be set as follows :

- | | |
|--|-------------------------|
| Q1. Compulsory questions multiple choice questions covering the entire syllabus | 10 X 1.5 = 15 Marks |
| Q2. Compulsory questions 4 Short answer questions covering the entire syllabus | 4 X 5 = 20 Marks |
| Q3. to 8 long answered questions covering the entire syllabus, three to be answered. | 3 X 15 = 45 Marks |
| | <hr/> Total = 80 Marks |
| Two Internal Assessment of ten marks each | 2 X 10 = 20 Marks |
| | <hr/> Total = 100 Marks |

GENETICS IV

Unit I - { Historical development in the field of genetics, organism suitable for genetic experimentation and their genetic significance. }

{ Mendelian genetics : Mendel's experimental design, monohybrid, di-hybrid and tri-hybrid crosses. Laws of segregation and principle of independent assortment, verification of segregates by test and back crosses. Chromosomal theory of inheritance, Allelic interaction, concept of dominance, recessiveness, incomplete dominance, co-dominance, Semi-dominance, pleiotrophy, multiple allele, pseudo allele, essential and lethal genes, penetrance and expressivity. }

Unit II - Non allelic interactions : Interaction producing new phenotype complementary genes, epistasis, (dominant & recessive) duplicate genes and inhibitory genes.

Genetic organization of prokaryotic, eukaryotic and viral genome, Structure and characteristics of bacterial and eukaryotic chromosome, chromosome morphology, chemical composition, concept of euchromatin and heterochromatin, packaging of DNA molecule into chromosome, chromosome banding pattern, karyotype, giant chromosome, one gene one polypeptide hypothesis, concept of

Unit III -

cistron, exons, introns, genetic code, gene function.

Mutation : Definition and type and causes of mutation, chemical and physical mutagens, induced mutations in plants and animals and microbes for economic welfare of human being. Variation in chromosome structures, chromosomal aberration in human beings, abnormalities - Aneuploidy and Euploidy Sex determination in plants and animals, sex linkage, mechanism environmental factor, Barr bodies, Sex linked gene expression, sex linked inheritance.

Unit IV -

Basic microbial genetics, conjugation, transduction, transformation, isolation of auxotrophs, replica plating techniques, Genetic linkage, crossing over and chromosome mapping. Extra chromosomal inheritance, population genetics : Hardy-weinberg equilibrium, gene and genotype frequencies.

Paper-5

Time 3hrs

Maximum Marks 80

In all 8 questions are to be set as follows :

Q1. Compulsory questions multiple choice questions covering the entire syllabus

10 X 1.5 = 15 Marks

Q2. Compulsory questions 4 Short answer questions covering the entire syllabus

4 X 5 = 20 Marks

Q3. to 8 long answered questions covering the entire syllabus, three to be answered.

3 X 15 = 45 Marks

Total = 80 Marks

Two Internal Assessment of ten marks each

2 X 10 = 20 Marks

Total = 100 Marks

MICROBIOLOGY V

Unit 1 -

Fundamentals, History, development and scope of microbiology. Classification of micro-organisms : Microbial taxonomy, criteria used including molecular approaches, classification of bacteria, nutritional classification.

Morphology and cell structure of major groups of microorganisms eg. Bacteria type, cell structure, microbial cell surface (gram positive gram negative, ultra structure of flagella, cyanobacteria, protozoa, viruses, Archaeobacteria, Rickettsias, PPLQs.

Unit 2 -

The concept of sterilization, methods of sterilization (Dry heat, wet heat, radiation, chemical and filtration etc.) cultivation and maintenance of microorganism, nutritional categories of micro

Unit 3 -

organism, methods of isolation, purification and preservation.
Microbial growth ; Growth curve, measurement of growth and factors affecting growth of bacteria.

Microbial metabolism : Respiration, photosynthesis,
Bacterial Reproduction : Transformation, Transduction and conjugation, endospore and sporulation in bacteria.

Unit 4 -

Control of Microorganisms: By physical, chemical and chemotherapeutic agent.

Pathogenic microorganism : Defence mechanism against microorganisms (Non specific defence only)

N₂ - Fixing microbes in agriculture.

Water microbiology : Bacterial pollutants of water, coliform and non coliforms, sewage composition and its disposal

Food microbiology : Important microorganism in food microbiology, moulds, yeast, bacteria, preservation of various types of foods, fermentation products of bacteria,

Significance of bacteria.

Paper-6

Maximum Marks 75

Time 6 hrs

BIOCHEMICAL TECHNIQUES VI

1. Qualitative tests for carbohydrates, lipids and proteins.
2. Quantitative estimation of sugars in given solution
3. Quantitative estimation of sugars in biological sample
4. Extraction and separation of lipids
5. Estimation of Proteins
6. Estimation of DNA/RNA
7. Isolation and purification of proteins
8. Assay of enzyme activity
9. Kinetic studies on enzyme
10. Chromatographic methods for separation of carbohydrates, lipids, and proteins

Paper-7

Maximum Marks 75

MICROBIOLOGICAL TECHNIQUES VII

1. Cleaning of glasswares
2. Preparation of media, cotton plugging and sterilization
3. Personal hygiene - Microbes from hands, tooth scum, and other body parts.
4. Isolation of micro organisms from air, water and soil samples, dilution and pour plating, colony purification.
5. Enumeration of micro organisms. Total V5 viable counts.
6. Staining methods : Simple staining, Gram staining, other staining method, metabolic characterization (e.g. IMV₂C test)
7. Isolation of bacteria and their identification
8. Growth curve of microorganism.
9. Antibiotic sensitivity of microbes, use of antibiotic discs.
10. Testing of water quality
11. Test for antibodies against given bacteria
12. One step growth of bacteriophage.
13. Culture from body fluids (stool, urine, blood).
14. Alcoholic and mixed acid fermentation.

Paper-8

Maximum Marks 50

PROJECT WORK VIII

The students will have to undergo on the job training in clinic (Hospital) a fermentation plant or bakery. They have to submit its report. A certificate would be issued by the department from the institution providing the training.