

University of Calcutta

Amended Syllabus of Papers-I & II in Molecular Biology
(General) Course under the new 1+1+1 examination system.

PART-I

PAPER - I

GROUP - A : BIOCHEMISTRY

FULL MARKS - 50

1. Biochemical characteristics of living matter :
Nature, scope and development of biochemistry as a discipline;
Biochemistry and the living state; chemical origin of living matter;
Buffer and pH.
2. Cell Biology :
Different types of cells; prokaryotic and eukaryotic cells;
leaf cell of a higher plant; structure and function of cell wall;
plasma membrane; nucleus; mitochondria; endoplasmic reticulum;
golgi complex; lysosomes; ribosomes.
- 3(a). Carbohydrates :
Mono, di and polysaccharides; deoxy sugars; reactions of
monosaccharides.
- (b) Lipids :
Triglycerides; fatty acids; phospholipids; membrane structure;
active transport.
- (c). Amino acids and proteins :
Structure and reactions of amino acids; structure of proteins;
general reactions of proteins; N-terminal and C-terminal amino acid
determination.
4. Enzymes :
Role of biocatalysis; nature, nomenclature and classification,
mechanism of enzyme action; coenzymes cofactors, enzyme inhibitors,
isozymes.
- 5(a). Bioenergetics :
Concept of free energy; biological oxidation; electron
transport chain; oxidative phosphorylation including chemiosmotic
hypothesis.
- (b). Metabolism of carbohydrates :
Formation and breakdown of glycogen; glycolysis; TCA cycle;
pentose phosphate pathway.

GROUP - B : BIOPHYSICS

FULL MARKS - 50

1. Radiation biophysics :
Introduction : radioactive emissions and their interaction
with matter; radioactive decay equation ; physical and biological
half lives (with simple problems).
Radiation units : detection and measurement of radiation (ionisation
chamber, proportional counter, Geiger-Muller counter; semiconductor
detectors; pocket dosimeter film badge; thermoluminescent dosimeter-
only basic working principles in brief for all detectors/dosimeters).
Acute and delayed biological effects; internal radiation
protection (viz. principle of control environmental control,
protective clothing; respiratory protection; waste management).
Radiation protection guide (Philosophy of radiation protection
and basic radiation safety criteria).

Contd.....P/2.

Moldeo Pass (~~3rd year~~)
2nd year

-: 2 :-

- ✓ 2. Optical and electron Microscopy :
Compound light microscope; ray diagram; basic working principle; oil-immersion objective; Resolving power; limit of resolution; physical basis of electron microscopy; Transmission electron microscope; ray diagram; basic working principle; preparation of biological samples; sectioning and spreading shadow casting and staining (in brief).

PART - II
PAPER - II

GROUP - A : BIOCHEMISTRY
FULL MARKS - 50

- U.G. 1. Nucleic acids : nucleosides, Purine and pyrimidine bases; nucleotides; RNA and DNA; replication; transcription, translation and genetic code.
- U.G. 2. Gene structure and function : Preliminary concepts, chromosome, gene, chemical nature of the gene.
- U.C. 3(a). Metabolism of fat : Catabolism of fat, oxidation of fatty acids.
(b). Metabolism of protein; General metabolism of amino acids, glucogenic and ketogenic amino acids, transamination, deamination, transmethylation, oxidation of amino acids, urea cycle.
- U.C. 4. Nutrition : Elements of nutrition, chemistry and physiology of water soluble vitamins and fat soluble vitamins.
- U.C. 5. Hormones : Chemical nature and general mode of action of hormones.

GROUP - B : BIOPHYSICS
FULL MARKS-50

- U. G. 1. Biophysical principles : Diffusion in liquids; osmosis; viscosity; centrifugation (sedimentation velocity; sedimentation equilibrium; density gradient centrifugation); light absorption -Beer-Lambert law; X-ray production and properties; basic principles of diffraction; medical applications.
- ✓ 2. Physical foundation of Molecular Biology: Structure of protein; DNA and RNA; elementary ideas of replication; transcription and translation; damage of genetic material and their repair; molecular basis of mutation; instances of molecular diseases.
- ✓ 3. Biostatistics : Basic mathematical skills; frequency distribution; mean, median, mode, standard deviation; Poisson and Gaussian distribution.

Papers III & IV of the General Molecular Biology syllabus effective from the academic session 2003-04 will remain unchanged for the new 1 + 1 + 1 examination system.

Paper-III, Group-A, Biochemistry Practical

Full Marks : 50 $20 + 5 + 10$

- M.P. 1. Preparation of buffers and measurement of pH.
2. Qualitative tests for glucose, sucrose, lactose, ribose, deoxy ribose and starch.
- M.P. 3. Test for cholesterol.
4. Chemical tests for amino acids and proteins; estimation of amino acids by formol titration.
5. Estimation of ascorbic acid in lemon juice by reaction with 2, 6 - dichlorophenol indophenol.
- M.P. 6. Separation of proteins by filter paper chromatography.

Paper-IV, Group-A, Biochemistry Theoretical

Full Marks - 30

1. Recombinant DNA Technology

Preliminary aspects of recombinant DNA technology -- basic concepts of genetic engineering.

2. Clinical Biochemistry :

Molecular mechanism of diseases. Clinically important enzymes. Drug metabolism and drug toxicity.

3. Microbial Biochemistry :

A brief idea about different types of microorganisms -- both pathogenic and non-pathogenic -- "mode of action of the antibiotics -- penicillin, streptomycin and chloramphenicol. Antibiotic resistance in microbes.

Paper-IV, Group-A, Biochemistry Practical

Full Marks - 20

Clinical Biochemistry :

- M.P. 1. Estimation of glucose in blood.
2. Estimation of cholesterol. M1
- M.P. 3. Assay of serum alkaline phosphatase, SGOT and SGPT.
4. Detection of blood groups.

Microbial Biochemistry :

1. Growth characteristics of bacteria (lag phase to log phase)
- M.P. 2. Simple staining and gram staining of bacteria.