

MB - 103 Biochemistry and Analytical Techniques

Section - I

Unit - 1 Biochemistry - I

15 hours

- 1.1. Basics of Chemistry for biologist
- 1.2. Protein Structure and Function : Amino Acids, Structure of Proteins, enzyme
- 1.3. Intermediary Metabolism: Bioenergetics and Oxidative Phosphorylation, Introduction to Carbohydrates, Glycolysis, TCA Cycle, Gluconeogenesis, Glycogen Metabolism, Metabolism of Monosaccharides and Disaccharides, PPP Pathway and NADPH, Glycosaminoglycans and Glycoproteins
- 1.4. Lipid Metabolism: Metabolism of Dietary Lipids, Fatty Acid and Triacylglycerol Metabolism, Complex Lipid Metabolism, Cholesterol and Steroid Metabolism

Unit - 2 Biochemistry - II

15 hours

- 2.1. Nitrogen Metabolism: Amino Acids: Disposal of Nitrogen, Amino Acid Degradation and Synthesis, : Conversion of Amino Acids to Specialized Products,
- 2.2. Integration of Metabolism : Metabolic Effects of Insulin and Glucagon, The Feed/Fast Cycle, Diabetes Mellitus, Obesity, Nutrition, Vitamins
- 2.3. Nucleotide metabolism: Characteristics and types of Nucleic acids, Biosynthesis and catabolism of purines and pyrimidines,
- 2.4. Molecular biology techniques: Principle and technique of nucleic acid hybridization and cot curve; sequencing of proteins and nucleic acids; Southern, Northern and South-Western blotting techniques; Polymerase Chain Reaction; Methods for measuring nucleic acid and protein interactions

Section - II

Unit - 3 Analytical Technique - I

15 hours

- 3.1. Electrochemistry: pH and buffers, Potentiometric and Conductometric titration, Agarose electrophoresis, Native PAGE, SDS PAGE, isoelectric focusing (IEF), two dimensional gel electrophoresis, gels
- 3.2. Purification and Identification of Bio molecules : Introduction to Chromatography, Column Chromatography, Ion-Exchange Chromatography, Gel Exclusion Chromatography, Affinity Chromatography and Immunoabsorption, Perfusion Chromatography, GC, HPLC, FPLC.
- 3.3. Histochemical and immunotechniques: Antibody generation, detection of molecules using ELISA, RIA, western blot, immunoprecipitation, flow cytometry and immunofluorescence microscopy, detection of molecules in living cells, in situ localization by techniques such as FISH and GISH.
- 3.4. Radiolabeling techniques: Properties of different types of radioisotopes normally used in biology, their detection and measurement, Autoradiography

Unit - 4 Analytical Technique – II

15 hours

- 4.1. Biophysical methods: Analysis of biomolecules using UV/visible, IR, Fluorescence, CD, ESR spectroscopy, structure determination using X-ray diffraction and NMR; analysis using light scattering, different types of mass spectrometry and surface plasma resonance methods, MALDI TOF, Atomic spectroscopy
- 4.2. Microscopic techniques: Light, Phase Contrast, Fluorescence, Scanning and Transmission Electron Microscopy and other Advanced Microscopy
- 4.3. Electrophysiological methods: Single neuron recording, patch-clamp recording, ECG, Brain activity recording, lesion and stimulation of brain, pharmacological testing, PET, MRI, fMRI, CAT.
- 4.4. Centrifugation technique, Biosensors

List of Experiments

1. Estimation of carbohydrates (Coles, DNS and Anthron method)
2. Estimation proteins (Folin, Bradford and Biurates)
3. Estimation of lipid
4. Estimation of inorganic phosphorus
5. Estimation of inorganic nitrogen
6. Determination of K^m and V^{max} for Enzyme
7. Enzyme inhibition study
8. Agarose gel electrophoresis for DNA
9. SDS PAGE analysis for Protein
10. 2D gel electrophoresis technique (Demonstration)
11. Determination of pK value
12. Separation of amino acid by paper chromatography
13. Separation of sugars/ fatty acid by thin layer chromatography
14. Determination of molecular weight of protein by Column chromatography

List of Reference Books

1. Lehninger, Principles of Biochemistry .
2. Lippincotts, Illustrated Reviews Biochemistry
3. David Holme, Analytical Biochemistry
4. Rodney Boyer, Modern Experimental Biochemistry
5. Hames and Hooper, Instant Notes in Biochemistry
6. Wilson and Walker, Principles and Techniques of Biochemistry and Molecular Biology
7. Debnath, Tools And Techniques Of Biotechnology
8. **Voet and Voet**, *Biochemist*