

PAPER- II: BIOMOLECULES AND METABOLISM

Unit I: Bioenergetics: entropy, enthalpy, Gibbs free energy concept, Laws of thermodynamics, Acids and Bases, redox potential, pH and Buffers, Henderson and Hasselbach equation, pKa, pKb. Preparation of buffers. Electron transport mechanism (chemi-osmotic theory), Energy rich molecules. Mechanism of ATP synthesis.

Unit II: Carbohydrates: classification, structure, properties and functions. Role of carbohydrates in signaling, glycosylation of other biomolecules. Carbohydrate derivatives: mucopolysaccharides, glycoproteins, glycolipids, peptidoglycan. Carbon fixation, Glycolysis and other pathways, Gluconeogenesis, Glycogenesis, Glycogenolysis. Estimation and detection of carbohydrates.

Unit III: Lipids: classification, structure, properties and functions of fatty acids, triacylglycerols, phospholipids, sterols and terpenes, Conjugated lipids - lipoproteins. ketone bodies, Lipids with specific biological functions, micelles and liposomes. Biosynthesis of saturated and unsaturated fatty acids. β -oxidation. Estimation and detection of lipids. Transport across membrane: types and mechanisms.

Unit IV: Amino acids : general properties and biosynthesis, Transamination, Deamination, Decarboxylation; glutamine and glutamic acid pathway, urea cycle, uric acid biosynthesis. Protein structure (primary, secondary, tertiary and quaternary). Ramachandran plot. Protein sequencing, Vitamins and Co-enzyme (biological and biochemical functions). Estimation and detection of proteins.

Unit V: Electrophoresis: Types, Principles and applications: Gel electrophoresis, SDS PAGE, Affinity electrophoresis, Capillary electrophoresis, Dielectrophoresis, DNA electrophoresis, Electroblotting, Electrofocusing, Immunoelectrophoresis, Isotachopheresis, Pulsed field gel electrophoresis. Methods of studying metabolism: Use of biochemical mutants, Isotopic labeling, Metabolome and its applications, Sequential induction technique. Computational methods.