

Section 1

Organization of life; Importance of water; Structure and function of biomolecules: Amino acids, Carbohydrates, Lipids, Proteins and Nucleic acids; Protein structure, folding/misfolding and function; Myoglobin, Hemoglobin, Lysozyme, Ribonuclease A, Carboxypeptidase and Chymotrypsin.

Section 2

Enzyme kinetics, regulation and inhibition; Vitamins and Coenzymes; Bioenergetics and metabolism; Generation and utilization of ATP; Metabolic pathways and their regulation: glycolysis, TCA cycle, pentose phosphate pathway, oxidative phosphorylation, gluconeogenesis, glycogen and fatty acid metabolism; Metabolism of Nitrogen containing compounds: nitrogen fixation, amino acids and nucleotides. Photosynthesis, Calvin cycle.

Section 3

Biochemical separation techniques: Ion exchange, size exclusion and affinity chromatography, centrifugation; Characterization of biomolecules by electrophoresis; DNA- protein and protein – protein interactions; UV-visible and fluorescence spectroscopy; Mass spectrometry.

Section 4

Cell structure and organelles; Biological membranes; Action potential; Transport across membranes; Membrane assembly and Protein targeting; Signal transduction; Receptor-ligand interaction; Hormones and neurotransmitters.

Section 5

DNA replication, transcription and translation; DNA damage and repair; Biochemical regulation of gene expression; Recombinant DNA technology and applications: PCR, site directed mutagenesis, DNA-microarray; Next generation sequencing; Gene silencing and editing.

Section 6

Immune System: Innate and adaptive; Cell of the immune system; Active and passive immunity; Complement system; Antibody structure, function and diversity; B cell and T Cell receptors; B cell and T cell activation; Major histocompatibility complex; Immunological techniques: Immuno-diffusion, immuno-electrophoresis, RIA and ELISA, flow cytometry; monoclonal antibodies and their applications.