

## Syllabus for Entrance Test for Admission to Ph.D. in Biochemistry, K.U.Kurukshetra

### Unit I

Composition, structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins), basic principles of pH, buffer and thermodynamics, Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes, enzyme inhibition, Conformation of proteins (Ramachandran plot, secondary, tertiary and quaternary structure; domains; motif and folds), Metabolism of carbohydrates, lipids, amino acids, nucleotides and vitamins.

### Unit II

Structural organization and function of Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility, Operon, structure of chromatin and chromosomes, unique and repetitive DNA, heterochromatin, euchromatin, transposons, Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, DNA damage and repair mechanisms, Transcription factors and machinery, transcription activators and repressors, RNA polymerases, transcription process, RNA processing, splicing, structure and function of different types of RNA, Ribosome, formation of initiation complex, initiation factors, elongation and elongation factors, termination, genetic code, translational inhibitors, post-translational modification of proteins, hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, secondary messengers.

### Unit III

Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms;  $\text{CO}_2$  fixation- $\text{C}_3$ ,  $\text{C}_4$  pathways, Plant mitochondrial electron transport and ATP synthesis, photorespiratory pathway, blood components and functions, plasma proteins, mechanism and regulation of blood coagulation, transport of gases, acid-base balance and its regulation, regulation of water and electrolyte balance, BMR, concept of protein quality, role of enzymes and isoenzymes in clinical diagnosis, detoxification mechanism of body.

### Unit IV

Isolation and purification of RNA, DNA (genomic and plasmid) and proteins, analysis of RNA, DNA and proteins by one and two dimensional gel electrophoresis, isoelectric focusing; molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems; expression of recombinant proteins using bacterial, animal and plant vectors; generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAC and YAC vectors; in vitro mutagenesis and deletion

techniques, protein sequencing methods, detection of post-translation modification of proteins; DNA sequencing methods, isolation, separation and analysis of carbohydrate and lipid molecules; RFLP, RAPD techniques.

#### Unit V

Antibody generation, detection of molecules using ELISA, RIA, western blot, immunoprecipitation, flow cytometry and immunofluorescence microscopy, Properties of different types of radioisotopes normally used in biology, their detection and measurement, safety guidelines, Visualization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes.