

M.D. Biochemistry Syllabus

PAPER I

General and Clinical Biochemistry

Constituents of human cell, their structure & functions. Properties of cell membrane and transport across membrane. Cytoskeletons. Functions of muscle proteins, hemoglobin, albumin and porins. Chemistry of blood clotting. Composition and diagnosis significance of cerebrospinal fluid and amniotic fluid. Acute phase proteins (hsp).

Properties and catalytic behavior of enzymes. Enzyme kinetics and regulation. Mechanism of action of enzyme catalysis. Therapeutic uses of enzymes. Diagnostic significance of serum enzymes and isozymes.

Quality control and automation in clinical biochemistry. Analysis of analytes in blood, urine and cerebrospinal fluid. Metabolic and respiratory acidosis and alkalosis.

Biostatistics and its application in research and clinical biochemistry. Selection of statistical methods and their evaluation. Sample size for designing experiments. Standard error. Standard deviation. Students 't' test. Paired 't' test. Chi-square test. Fisher's exact test. Non-parametric tests of significance. Multivariate analysis methods. One-way and two-way analysis of variance. Multiple range tests.

PAPER II

Intermediary Metabolism and Bioenergetics

Metabolism of aromatic amino acids, proteins (excluding protein biosynthesis), carbohydrates, lipids, heme, purines and pyrimidines. Interrelationships and regulation of metabolic pathways. Inborn errors of metabolism. Principles of bioenergetics, electron transport chain and oxidative phosphorylation.

Metabolism of Ca, Pi, and trace elements (Se, Zn, Cu, Fe). Role of Na, K, and Cl in homeostasis and related disorders. Regulation of acid-base balance.

Biochemical functions of vitamins, their deficiency and toxicity. Vitamin-responsive inherited metabolic disorders. Role of vitamins in free radical homeostasis. Chemistry and pathology of free radicals and antioxidants.

Role of hormones in the regulation of metabolism and mechanism of their action. Consequences of hormone dysfunction. Eicosanoids.

PAPER III

Immunology and Molecular Biology

Immune response. Cellular and protein components of the immune system. Antibody diversity and immunoglobulin genes. Multiple myeloma. Complement. Antigen-antibody reactions. Monoclonal antibodies and their role in diagnostics and therapeutics. Cytokines. Tumor immunology. Alpha fetoprotein and carcinoembryonic antigen. Growth factors and

oncogenes. Carcinogenesis and p-53 gene. Immunobiology of HIV and anti-HIV drugs. Stem cells and their possible role in therapy. Apoptosis, telomers and telomerase.

Regulation of replication, transcription and translation. Hormone responsive elements. Recombinant DNA Technology and its application. Human genome project and its implications. Principles of cloning. DNA vaccines. Genomics and proteomics. Antisense therapy.

PAPER IV

Biochemical and Molecular Biology Techniques

Basic principles of sedimentation and analysis of sub-cellular fractions. HPLC, affinity chromatography, immunodiffusion. Principles of electrophoresis, ultraviolet and visible light spectroscopy, circular dichroism spectroscopy and spectrofluorometry. Bioinformatics.

Band shift assay, array technology and DNA fingerprinting. ELISA and radioimmunoassay, immunoblotting and polymerase chain reaction. Gene cloning, restriction mapping of DNA fragments and cell culture. Nanomedicine technology. Enzyme engineering.

Ph.D. Course Work Syllabus of Biochemistry

Paper-I (Theory)

Unit-I: General Biochemistry:

Chemistry of Carbohydrates, Proteins and Lipids. Enzymes- Properties and catalytic behavior, Enzyme kinetics and regulation. Nucleic Acid Chemistry, Replication, Transcription and Translation, Gene Expression in prokaryotes and eukaryotes. Biochemical functions of vitamins,

their deficiency and toxicity. Immunobiology of HIV. Hormones and their action. Principles of recombinant DNA technique, PCR & RT PCR, Southern, Western and Northern blot, DNA & RNA sequence analysis.

Unit-II: Biochemical and Immunological Techniques:

Principles and applications of- Spectroscopic methods (UV-visible, Fluorescence, Circular dichroism, and mass spectrometry), Electrophoresis, Centrifugation, Chromatography, Immunodiffusion, RIA and ELISA. Knowledge of Electron microscopic techniques, NMR, MALDI/TOF, X-ray diffraction. Restriction mapping of DNA fragments and Enzyme engineering. Immunofluorescence and Hybridoma technology.

Unit III: Research Methodology, Quantitative Methods, Computer Applications Biostatistics and Bioinformatics:

Meaning of research, Objectives of research, Selection of research problem, Development of working hypotheses and its testing, Literature survey, Experimental design, Validation of methods, Processing and analysis of data, Interpretation of data and conclusion, Ethical rules

for research. Applications of Internet explorer, Search engines, Reference manager/End note and Microsoft office. Computational analysis of data, Students 't' test, Chi-square test, ANOVA, HBSS, Multiple range tests, Standard deviation.

Unit-IV: Clinical Applications of Biochemistry

Therapeutic uses of enzymes, Diagnostic significance of serum enzymes and isozymes, DNA Vaccines, Nanomedicine Technology, Mode of action of anti-HIV drugs, Various modes of Cancer therapy, Stem cell therapy.

Biochemistry Paper-II is prepared by the concerned supervisor of the student and passed in the meeting of the Board of Studies.