Syllabus for Biochemistry Master's

Section 1: Subject Knowledge

Please Note: A Total of 40 Questions will be asked, combining the following topics, with the difficulty level commensurate to a Master's Candidate.

Unit I: General Biochemistry

Cellular structures (prokaryotes and eukaryotes) and major biomolecule classes, Chemistry and roles of sugars, nucleic acids, and lipids, Water's role in biomolecule design, Coenzymes, metal ions, and their metabolic significance.

Unit II: Cell Biology and Membrane Biochemistry

Overview of cellular structures, chemical principles, and major biomolecule classes (amino acids, peptides, sugars, nucleic acids, lipids), Structure and function of biomolecules, including vitamins, coenzymes, and metal ion-containing compounds, Biological roles of water and biomolecular design.

Unit III: Molecular and Cellular Immunology

Antigen-antibody binding and assays; Immunoassays –types [RIA, ELISA, Chemiluminescent IA, FIA] and specific applications, Immunohistochemistry-principle and techniques, Immunodiagnostics for detection of infectious agents, cancer, and autoimmune diseases, Immunosensors.

Unit IV: Enzymology

Enzyme catalysis mechanisms, kinetics (Km, Vmax), and inhibition types, Mechanisms of enzyme regulation and action (eg chymotrypsin), Enzyme applications in medicine and industry, including clinical diagnostics and immobilized enzymes.

Unit V: Plant Biochemistry

Structure of PSI and PSII, light reactions, Calvin cycle, C3 & C4 cycles, photorespiration, and glycolysis, TCA cycle, glyoxalate cycle, and nitrogen metabolism, Overview of plant secondary metabolites: alkaloids, phenolics, and terpenoids, and their biological roles.

Unit VI: Recombinant DNA Technology and Applications in Biotechnology Media preparation, E, coli culturing, gene cloning, and functional analysis, PCR optimization, primer design, DNA ligation, transformation, and selection of recombinants, Practical exercises include DNA amplification, purification, restriction digestion, ligation, and E, coli transformation.

Unit VII: Developmental Biology

Second messengers (cAMP, cGMP, IP3, DAG, Ca²⁺, NO) in signal transduction, Cancer development, genetic basis, oncogenes, tumor viruses, and molecular treatments, Overview of the cell cycle, mitosis, meiosis, apoptosis, stem cells, and therapeutic cloning.

Unit VIII: Bioenergetics and intermediary metabolism

Components in the diet, A balanced diet and the concept of RDA, Kwashiorkor and Marasmus, Scurvy, beri beri, pellagra and B12 deficiency, Xerophthalmia and Night blindness, Vitamin D deficiency, Vitamin K deficiency, Discuss with relation to the biochemical basis for symptoms.

Unit IX: Clinical and Industrial Biochemistry

Organization and automation in clinical labs, safety, and specimen collection, Precision and quality control in biochemical analysis, Hepatic, renal, and cardiovascular physiology, Diagnostic biochemical profiles and enzyme markers for heart disease (AST, creatine kinase, LDH, troponin).

Unit X: Human Genetics and Molecular Medicines

Gene definition and chromosomal organization in viruses, bacteria, and eukaryotes, DNA replication, recombination, and repair mechanisms, Regulation of transcription: prokaryotic operons (lac and trp) and eukaryotic regulation (enhancers, silencers, RNA interference).

Unit XI: Microbiology and Industrial Biochemistry

Overview of bacteria, viruses, protozoa, and fungi, Infectious diseases, pathogen transmission, antigenic variation, and host-parasite interactions, Tuberculosis and AIDS: agents, pathogenesis, diagnostics, therapeutics, and drug resistance, Other diseases: typhoid, diphtheria, tetanus, pneumonia, hepatitis, influenza, rabies, chikungunya, and polio.

Section 2: Fundamental Skills

Please Note: A Total of 24 Questions will be asked, combining the following topics, with the difficulty level commensurate to a Master's Candidate.

Unit I: Data Analysis Unit II: Math and Statistics Unit III: Lab Skills Unit IV: Reading and Writing

Section 3: Specific Skill Proficiency

This section has more than 30 skills. You can select the ones you are proficient in from the enrollment form. You can choose a maximum of 4 skills. Each skill contains 10 questions.

