

# Syllabus for Biochemistry Bachelor'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 Bachelor's Candidate.

### Unit I: Introduction to Biochemistry and Biomolecules

Overview of the structure, function, and diversity of biomolecules, Composition of living matter, cell wall structure of bacteria (gram-positive and gram-negative), carbohydrates, lipids, amino acids, nucleic acids (DNA and RNA), and vitamins (fat-soluble and water-soluble).

### Unit II: Bioorganic Chemistry and Metabolites

Fundamentals of atomic structure, dual nature of matter, Heisenberg Uncertainty Principle, Atomic orbitals, Electron configurations, stability of orbitals, and anomalous configurations, Overview of ionic and covalent bonding, lattice energy, Born-Haber cycle, VSEPR, Resonance and Hybridization.

### Unit III: Cell Biology

Structure and function of the cell organelles, Cell-cell and cell-matrix interactions, Cell signaling, signal transduction and regulatory networks, Overview of the cell cycle, mitosis, meiosis, programmed cell death, and stem cells, Fundamentals of cancer biology, including oncogenes, tumor suppressor genes, and molecular approaches to cancer treatment.

### Unit IV: Biochemical Techniques

SDS electrophoresis and Western Blotting, Enzyme-linked Immunosorbent assay (ELISA), Dot Blot, Cytotoxic Assay-LDH, Principle and instrumentation of UV-visible and fluorescence spectroscopy, Determination of the absorption maxima and molar extinction coefficient, Fluorescence spectrum.

### Unit V: Clinical Biochemistry

Clinical laboratory, Clinical biochemistry laboratories safety regulations and first aid, Specimen collection, and types of specimens for biochemical analysis, Precision, accuracy, quality control, precautions, and limitations, Variations in blood glucose, Diabetes mellitus, lipoproteins.

### Unit VI: Nutrition

Nutrient components of the diet, A balanced diet and the concept of RDA, Kwashiorkor and Marasmus, Scurvy, beri beri, pellagra and B12 deficiency, Xerophthalmia, Night blindness, Vitamin D deficiency, Vitamin K deficiency, Biochemical basis for symptoms.

### Unit VII: Metabolism

Amino acid metabolism, including digestion, absorption, transamination, deamination, and urea cycle, Catabolism of glucogenic and ketogenic amino acids and biosynthesis of non-essential amino acids, Disorders of amino acid metabolism and precursor functions of amino acids, Purine and pyrimidine nucleotide biosynthesis, regulation, and salvage pathways.

#### Unit VII: Human Physiology

Digestion and absorption, Breathing and gas exchange, Body fluids and circulation, Excretory products and elimination, Locomotion and movement, Neural control and coordination, Chemical coordination and integration.

#### Unit VIII: Microbiology

Overview of bacteria, viruses, protozoa, and fungi, Emerging and re-emerging infectious diseases, pathogen transmission, and host-parasite interactions, Basics of viral and bacterial pathogenesis, infection mechanisms, and immune evasion, Characteristics of acellular and cellular microorganisms.

#### Unit IX: Immunology

Historical overview of humoral and cellular immunity, Cells and organs of the immune system, Innate immunity (barriers, receptors, complement system) and adaptive immunity (B-cells, T-cells, antibodies, MHC), Mucosal immune system, and immune regulation.

#### Unit X: Enzymology

Introduction to enzymes, their classification, and catalytic features, Enzyme kinetics, Michaelis-Menten equation, and inhibition types, Mechanisms of action for key enzymes and coenzymes, Regulation of enzyme activity, and examples of enzyme inhibitors.

#### Unit XI: Molecular Biology and Genetic Engineering

Transcription and translation in prokaryotes and eukaryotes, RNA modifications (splicing, editing, transport), Translation process, regulation, and inhibitors, Transcriptional regulation in prokaryotes (lac, trp operons) and eukaryotes (activators, repressors, gene silencing, regulatory RNAs).

### **Section 2: Fundamental Skills**

Please Note: A Total of 28 Questions will be asked, combining the following topics, with the difficulty level commensurate to a Bachelor'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 2 skills. Each skill contains 10 questions.