

## **Syllabus for Entrance test for MSc. Clinical Biochemistry, 2025**

**Note:** The syllabus prescribed for the entrance test has been divided into fifteen units. Each unit carries a weightage of four marks. Paper setters are required to set four multiple choice type questions with only one correct or most appropriate answer separately for each unit, giving uniform representation to the whole syllabus contained therein.

### **Unit I**

Bioenergetics, Energy change during a biochemical reaction, Endergonic and Exergonic reactions, Energy transformation in biological systems, Total internal energy, Gibbs free energy concept, Significance of free energy, Spontaneity of a biochemical reaction, Energy rich compounds in living organisms and their classification, Phosphoryl transfer potential, Coupled reactions, ATP as energy currency, ATP-ADP cycle

### **Unit II**

Carbohydrates: Monosaccharides, disaccharides and polysaccharides, reducing and non-reducing sugars, anomers and mutarotation. Lipids: Structure and classification, chylomicron, triacylglycerols and phospholipids, Vitamins: General classification, metabolic role and common disorders associated; Nucleic acids: Structure and properties of purines and pyrimidines, nucleotides, nucleosides, DNA double helix; Structure and classification of amino acids; primary, secondary, tertiary and quaternary structure of proteins

### **Unit III**

Enzymes: General characteristics, nomenclature and classification of enzymes, coenzymes and their role in enzyme activity; Enzyme activity and factors affecting enzyme activity; Enzyme kinetics - determination of Michaelis-Menton kinetics for uni-substrate enzyme, determination of kinetic parameters, regulation of enzyme activity - allosteric; Enzyme inhibition- competitive and non-competitive

### **Unit IV**

Metabolism and related disorders of: Carbohydrates - Glycolysis, Krebs cycle, Pentose phosphate pathway, Gluconeogenesis, Glycogenesis, Glycogenolysis, Inborn errors - Galactosemia; Lipids - Biosynthesis and degradation of fatty acids, Ketone bodies, Disorders- lipid storage disease; Biosynthesis and degradation of purines and pyrimidines, Lesh-Nyhan syndrome; Biosynthesis and degradation of aromatic amino acids, Transamination and oxidative deamination, urea cycle, Inborn errors - Phenyl ketonuria, Tyrosinemia

## **UNIT V**

Structure of Prokaryotic and Eukaryotic cells, Cell Membrane structure & function, Membrane Transport, Structure and function of cell organelles - ER, Golgi, Nucleus, Mitochondria and lysosome. Role of mitochondria in ATP synthesis, Mitochondrial diseases and lysosomal storage diseases; Structure and function of microtubules, microfilaments and intermediate filaments

## **UNIT VI**

Central dogma of molecular biology, Evidences for DNA as a genetic material - DNA transformation and conjugation in bacteria, Structural organization of DNA and RNA, C-value paradox; Replication in prokaryotes and eukaryotes, concept of replicon, Origin of replication in prokaryotes and eukaryotes, fidelity of replication, Basic mechanism of transcription and translation in prokaryotes and eukaryotes, operon concept, transcription and translation inhibitors

## **UNIT VII**

Historical perspective to microbiology, classification and importance of microorganisms in health and disease; Introduction to microbial systems; Structure and Classification of viruses and bacteria, Virulence and pathogenesis, Host-pathogen relationship, Common bacterial and viral diseases- pneumonia, tuberculosis, malaria, COVID; Antimicrobial agents and antibiotic resistance

## **UNIT VIII**

History, scope and significance of immunology, Innate and adaptive immunity, Basic concepts of specific and Non-specific immune responses, Structure and function of Immunoglobulins, Properties of antigens and immunogens, antigen-antibody interaction, Immunodeficiency disorders – primary and acquired, AIDS, SCID

## **UNIT IX**

Mendelian genetics – concept of heredity and inheritance, laws of inheritance - monohybrid, dihybrid cross, chromosomal basis of segregation, concept of allele, independent assortment, Incomplete dominance, co-dominance, Linkage and crossing over, Chromosome organization - Structural and Numerical changes in Chromosomes- Down's syndrome, Tay Sachs syndrome; Histone modifications and their role in gene expression

## **UNIT X**

Gene cloning- Introduction and steps in gene cloning, transformation, cloning vectors - Properties of a good vector, Plasmids- Size and copy number, plasmid based vectors; Features and applications of bacterial artificial chromosome and yeast artificial chromosome, Applications of Gene Cloning and recombinant DNA technology (rDNA), restriction endonucleases, Ligases, reverse, Polymerase chain reaction - types and associated enzymes, role of rDNA in vaccine and drug development – adenovirus vector based vaccines

## **UNIT XI**

History and scope of Clinical Biochemistry, role of clinical biochemistry in health and disease, quality control, body fluid and specimens: blood, urine and CSF; Clinical lab diagnosis; Kidney, Liver and thyroid function tests (KFT, LFT, and TFT), Lipid profile, Glucose tolerance tests, Urine and stool examination, Concept and applications of Point of care testing

## **UNIT XII**

Components and functions of blood and lymph, Types of Blood groups (ABO & Rh), Types and functions of blood cells, Haematopoiesis & Erythropoiesis. Platelets & Blood coagulation, Haematological disorders- Anaemia, Haemophilia, Thrombosis, Edema, Inflammation, Mediators of Inflammation, Acute and Chronic Inflammation

## **UNIT XIII**

General organization, physiological functions and disorders of organ systems including Excretory-Urine formation, disorders- glomerulonephritis, GFR, clearance tests; Gastrointestinal- Digestion and absorption of carbohydrates, protein and fats, digestive hormones, disorders - irritable bowel syndrome, peptic ulcers, Crohn's disease

## **UNIT XIV**

Structure and physiology of heart, cardiac cycle, disorders- shock and hypertension, myocardial infraction; Endocrine- physiological role of thyroid, pituitary, adrenal medulla and cortex, Graves' disease. Neuromuscular- Structure of neuron, nerve impulse conduction, types of muscle tissue and mechanism of muscle contraction, Alzheimer's

## **UNIT XV**

Centrifugation: Basic principle – Relative centrifugal force, sedimentation velocity and sedimentation coefficient; Principle and applications of differential centrifugation and density gradient centrifugation; Spectroscopy - Principles and application of Absorption & Fluorescence spectroscopy; Electrophoresis - Principle, Instrumentation & applications of polyacrylamide and agarose gel electrophoresis; Chromatography – Basic principle, Paper and Thin layer chromatography, Column chromatography – Principle and application of size exclusion and affinity chromatography

Head of Department