Department of Clinical Biochemistry
University of Kashmir, Srinagar

ENTRANCE TEST SYLLABUS
(Two -Year PG program)

UNIT-1

Basic concept of core laboratories, Fundamentals of Clinical Biochemistry, Point of care testing, Automation in clinical laboratories, Ethics of laboratory practice. Quality control in clinical biochemistry-pre-analytical, analytical and post-analytical, Internal and external quality control, Quality control charts, Measures of diagnostic accuracy-precision, accuracy, sensitivity, specificity and predictive values. Laboratory hazards- Biological, chemical, radiation and fire hazards; Biosafety in clinical laboratory biological safety, chemical safety and radiation safety

UNIT-2

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-3

Structure of prokaryotic and eukaryotic cell, cell wall structure, Bio-membranes: composition, structure and functions, Membrane transport-active and passive diffusion, Overview of cell division – mitosis and meiosis, introduction to cell cycle checkpoints (CDKs and Cyclins), Cytoskeleton: structure and functions, Regulation of cell cycle, Structure and function of Nucleus, Nucleolus, Endoplasmic reticulum, Golgi apparatus and mitochondria, Structure and function of microtubules, microfilaments, intermediate filaments

UNIT-4

DNA as a genetic material (experimental evidences), Structural features of double helix. Conformational forms of DNA, C-value paradox. Organization of prokaryotic and eukaryotic Chromosomes. Mechanism of replication in prokaryotes and eukaryotes, Semiconservative nature of DNA replication, Fidelity of replication. Fine structure of genes in eukaryotes and prokaryotes, Structure and types of RNA

Unit-5

Mechanism of transcription in Prokaryotes and Eukaryotes (initiation, elongation, and termination), the roles of enhancers and silencers, post-transcriptional modifications, Operon concept (Lac operon), Genetic code, Wobble hypothesis, Ribosome structure and assembly, organization of 70S and 80S ribosomes, their rRNA subunits, concept of polysomes, Mechanism

of translation in Prokaryotes and Eukaryotes, role of aminoacyl-tRNA synthetases, key post-translational modifications

UNIT-6

Historical perspective of microbiology, Classification of microorganisms, importance of microorganisms in health and disease, normal human microflora, discovery of penicillin and vaccination. Bacteria: classification and structure, gram positive and gram-negative bacteria, principles of staining, bacterial culture, growth, growth curve and its stages, factors affecting growth. Host-pathogen interaction, pathogenicity, virulence, common bacterial diseases (MTB, Pneumonia), viral diseases (AIDS and COVID)

UNIT-7

History and scope of Immunology, Innate and Adaptive Immunity, Cellular and Humoral Immune response, Primary and secondary immune response, Antigens and Immunogens, Properties of immunogens, Epitopes - T and B cell epitopes, Haptens, Structure and functions of antibodies, Monoclonal antibodies, Hybridoma technology, Antigen-antibody reactions, Autoimmunity and autoimmune disorders, Hypersensitivity and its types, Vaccines, immunization, Immunodeficiencies- primary and acquired, SCID and AIDS

UNIT-8

Overview of cell communication and signal transduction. Components of signalling pathways: ligands and receptors, cell surface and intracellular receptors. Types of cell Signalling: autocrine, paracrine, endocrine and juxtracrine. Structure and function of G protein-coupled receptors (GPCRs), receptor tyrosine kinases (RTKs) and ion channels. Ligands utilizing GPCR pathway, Protein Kinase in cell signalling; receptor mutations leading to cancer

UNIT-9

Nucleic acid assay techniques, Nucleic acid variation used for NAT assays particularly in alterations in human, bacterial and viral genomes, Amplification Techniques: Target amplification (PCR), other approaches to amplification, Endpoint quantification in amplification assays, Real-time PCR, Melting analysis, SNP genotyping/RFLP. Molecular assays for HIV and SARS CoV2.

UNIT-10

Hepatobiliary System: Anatomy and physiology of liver, Bile- composition and secretion, Bilirubin-synthesis and degradation, Pathogenesis and diagnosis of Jaundice and Hepatitis. Renal System: Anatomy and physiology of kidney, Ultrastructure of nephron and urine formation, Pathogenesis and diagnosis of Glomerulonephritis. Tests of kidney function: GFR, Clearance tests (creatinine and inulin clearance), plasma creatinine, Urinalysis. Composition, cellular elements and functions of blood, Blood coagulation and coagulation tests- PT, INR

Unit 11

General characteristics and classification of hormones, Difference between enzymes and hormones, Mechanism of hormone Action, Regulation of hormone secretion. Physiology and

associated disorders of Hypothalamus, Pituitary Gland, Thyroid Gland and Parathyroid gland. Structure and physiological role of the hormones, Hyper- and hypo- thyroidism, pancreatic hormones, adrenal hormones, type II Diabetes, Grave's disease, Hashimoto hypothyroidism

UNIT 12

Basic principle of centrifugation: RCF, sedimentation velocity and sedimentation coefficient. Principle and application of differential centrifugation, density gradient centrifugation; Basic principle of chromatography, Paper and Thin Layer, and Size exclusion chromatography; Basic principles of spectroscopy, Beer-Lambert's Law, Principle, instrumentation and applications of UV-Visible spectrophotometry; Principle & applications of light, Phase contrast Microscopy and electron microscopy

UNIT-13

Clinical pathology- History and Introduction, Types, Causes, Mechanism of cell injury, necrosis and apoptosis, Mechanism of acute and chronic inflammation, Granuloma formation, Tissue repair. Shock, Infarction and Oedema, Transudate and Exudate, Introduction to histopathology, Collection, handling and storage of tissue specimens, Basic concepts of fixation and fixatives, Tissue processing: manual and automated methods, safety measures in histopathology lab

UNIT-14

Historical background of enzymes, Nomenclature and classification of enzymes, Coenzymes and cofactors, Mechanism of enzyme action, Active site, Factors affecting enzyme activity, Isoenzymes and multienzyme complexes. Definition and types of Enzyme Inhibition, Regulation of Enzyme activity- Allosteric regulation and covalent modification, Enzyme pattern in health and disease with special mention of – serum transaminases, Alkaline phosphatase, Creatine Kinase, Lactate Dehydrogenases and Acid Phosphatases

UNIT-15

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, Epigenetics; Histone modifications and their role in gene expression

UNIT-16

Structure, anatomy and physiology of digestive system: Digestion and absorption of Carbohydrates, proteins and fats. Phases of digestion. Digestive hormones. Digestive system disorders: Irritable bowel syndrome. Structure, anatomy and physiology of heart, cardiac cycle (cardiac output, venous return and their regulation), Disorders of cardiovascular system: Myocardial Infarction, congestive heart failure, Atherosclerosis