Table of Specification – PhD Biochemistry - Spring 2024

NUMS Entry Test

S .No	TOPIC	MCQs
1.	**Cell and Cell Signaling** ○ Types of receptors and mechanisms ○ Second messenger systems ○ Nitric oxide synthase and its role in signaling ○ Cell Signaling and Human diseases (HCV, Cholera, Dyslipidemia, Hyperlipidemia, Bordetella pertussis)	07
2.	**Enzymology** ○ Properties of enzymes ○ Factors affecting activity of enzymes ○ Enzymes kinetics ○ Enzyme inhibition ○ Regulation of enzymes ○ Isoenzymes ○ Enzymes in clinical diagnosis – CLINICAL ENZYMOLOGY	05
3.	**Chemistry, Metabolism and related diseases of Carbohydrates** ○ Composition and functions of Monosaccharides, Disaccharides, Oligosaccharides and Polysaccharides, Glycoproteins, Glycosaminoglycans ○ The Glycolytic Pathway ○ Gluconeogenesis ○ Glycogenesis and Glycogenolysis ○ Advanced Glycation End Products ○ TCA and Pyruvate Dehydrogenase Complex ○ Pentose Phosphate Pathway and NADPH ○ Synthesis and degradation of glycosaminoglycans ○ Regulation of metabolic pathways ○ Glycogen Storage diseases	10
4.	**Chemistry and Metabolism of Lipids** ○ Classification, structure and functions of lipids ○ Properties of lipids (peroxidation, rancidity, ROS) ○ Eicosanoids, their classification and functions in health and disease ○ Fatty acid synthesis and oxidation ○ Metabolism of phospholipids ○ Metabolism of cholesterol ○ Metabolism of lipoproteins ○ Ketogenesis and ketolysis ○ Disorders of lipid metabolism	10

5.	**Chemistry and Metabolism of Amino Acids and Proteins** ○ Chemical properties of amino acids ○ Classification and functions of proteins ○ Separation and study techniques of proteins ○ Plasma proteins and immunoglobulins ○ Amino acid pool and dietary protein digestion ○ Nitrogen disposal from amino acids ○ Nitrogen balance- Urea Cycle steps and regulation ○ Ammonia metabolism ○ Metabolism of individual amino acids ○ Synthesis and degradation of hemoglobin ○ Hemoglobinopathies ○ Porphyrias ○ Inborn errors of metabolism	10
6.	**Nucleotide Metabolism & Basic Molecular Biology** ○ Structure and biomedical functions of nucleotides, nucleosides and nucleic acids ○ Synthesis and degradation of purines and pyrimidines ○ Gout and Lesch Nyhan syndrome ○ DNA replication ○ DNA damage and repair system ○ Transcription and posttranscriptional modifications ○ Mutations ○ Translation and post-translational modifications ○ Single nucleotide polymorphism	10
7.	**Molecular Techniques & Xenobiotics Metabolism** ○ Solution & buffer system ○ Principles & applications of the following in Biochemistry: ○ Amino Acid Analyzer ○ Chromatography ○ PCR & Electrophresis ○ Mass Spectroscopy ○ ELISA ○ Spectrophotometry ○ Restriction endonucleases ○ Phase I and Phase 2 Reactions of Xenobiotics Metabolism	05
8.	**Endocrinology** Chemistry, functions, synthesis, regulation and hyper & hypo and disease states of the following hormones: ○ Thyroid ○ Parathyroid ○ Adrenal ○ Pancreatic ○ Pituitary ○ Steroid hormones (Testosterone, Progesterone, Estrogen, **Calcitriol**)	10

9.	**Nutritional Biochemistry** ○ Dietary reference intakes ○ Nutritional aspects of carbohydrates, fats and proteins ○ Glycemic Index ○ Water soluble vitamins ○ Fat soluble vitamins ○ Minerals	5
10.	**Bioenergetics** ○ Electron transport chain ○ Oxidative phosphorylation ○ ATP synthase---structure and functions ○ Uncouplers and inhibitors ○ Shuttle mechanisms	5
11.	**GIT** ○ Digestion, Absorption, Transport of Carbohydrates, Proteins, Lipids and Nucleoproteins ○ Composition, functions, daily secretion, stimulants and depressants of I. Saliva II. Gastric Juice III. Succus Entericus IV. Pancreatic Juice V. Bile Juice ○ Biochemical disorders of GIT, e.g. achlorhydria, peptic ulcers, lactose intolerance, cholelithiasis	8
Total		**85**