

BIOCHEMISTRY SYLLABUS FOR M.B.B.S.

Paper-I (Biochemistry)

1. Chemistry and metabolism of proteins; blood serum proteins with special reference to lipoproteins; metabolism of phenylalanine, tyrosine, tryptophan, histidine and sulphur containing amino acids, inborn errors of amino acids metabolism.
2. Chemistry and metabolism of carbohydrates; glycolysis, TCA cycle, electron transport chain and oxidative phosphorylation; glycosuria, galactosemia and glycogen storage diseases, diabetes mellitus: its diagnosis and acute metabolic complication; glycogen metabolism, gluconeogenesis and pentose phosphate pathway.
3. Chemistry and metabolism of lipids; transport of lipids; pathological disturbances in lipid metabolism, metabolism of cholesterol and its clinical association with disease; lipids and linkage of cardiovascular diseases with cancer.
4. Purine and Pyrimidine metabolism.
5. Deficiency and toxicity diseases of inorganic elements; metabolism of calcium, phosphorus, sodium, potassium, iron, iodine and zinc.
6. Role of vitamins and hormones in metabolism; hormone action with special reference to cyclic-AMP, insulin and prostaglandins, therapeutic uses of vitamins and prostaglandins.
7. Biochemical tests in liver diseases; porphyrias, biochemical basis of ageing and cancer, defects in bilirubin metabolism.
8. Transport across membranes; mediated, passive and active transport systems; sodium pump; active transport of sugar and amino acids.

Paper-II (Biochemistry)

1. Molecular and functional organization of cell and its sub-cellular components.
2. Properties, classification and kinetic behavior of enzymes; activators and inhibitors; coenzymes and prosthetic groups; allosteric enzymes and isozymes; clinical significance of serum enzymes level.
3. Chemistry of nucleic acids; DNA as genetic material; size, structure and conformations of DNA; types of RNA; retroviruses.
4. Flow of genetic information; DNA replication, transcription and translation; ribosomes, codons and anticodons; post translational modifications of protein and protein targeting.
5. Outlines of the molecular mechanisms of gene expression and regulation; basic concepts of cloning.

6. The principles of genetic engineering and their applications in medicine, DNA finger printing.
7. Basic concepts of immunochemistry; introduction to immune response; immunoglobulins, major histocompatibility complex (MHC), B- & T-lymphocytes; heterogeneity of antibodies; monoclonal antibodies; immunological techniques and AIDS.

Reference material prescribed by the Department for M.B.B.S. course

1. Harper's Illustrated Biochemistry 28th edition.
2. Lehninger, Principles of Biochemistry 5th edition.
3. Biochemistry, Berg and Stryer, 6th edition
4. Lippincott's Biochemistry 4th edition

Biochemistry Syllabus for B.D.S.

1. CHEMISTRY OF BIOORGANIC MOLECULES

Carbohydrates: Definition, biological importance and classification. Monosaccharides – isomerism, anomerism. Sugar derivatives, Disaccharides. Polysaccharides. Structures of starch and glycogen.

Lipids: Definition, biological importance and classification. Fats and fatty acids. Introduction to compound lipids. Hydrophobic and hydrophilic groups. Cholesterol. Bile salts. Micelle. Bimolecular leaflet.

Proteins: Biological importance. Aminoacids: Classification. Introduction to peptides, Proteins: Simple and conjugated; globular and fibrous. Charge properties. Buffer action. Introduction to protein conformation: Denaturation.

Nucleic acids: Building units. Nucleotides. Outline structure of DNA and RNA.

High energy compounds: ATP, Phosphorylamidines, Thioesters, Enol phosphates.

2. MACRONUTRIENTS AND DIGESTION

Energy needs: Basal metabolic rate. Dietary carbohydrates, fibres. Dietary lipids, essential fatty acids. Nitrogen balance. Essential amino acids. Protein quality and requirement (methods for evaluation of protein quality to be excluded). Protein calorie malnutrition. Balanced diet.

Enzymatic hydrolysis of dietary carbohydrates. Mechanism of uptake of monosaccharides. Digestion and absorption of triacylglycerols. Enzymatic hydrolysis of dietary proteins and uptake of amino acids.

3. MICRONUTRIENTS

Vitamins: Definition, classification, daily requirement, sources and deficiency symptoms.

Brief account of water-soluble vitamins with biochemical functions. Vitamin A functions including visual process. Vitamin D and its role in calcium metabolism. Vitamin E. Vitamin K and gamma carboxylation. Introduction to antivitamins and hypervitaminosis.

Minerals: Classification, daily requirement. Calcium and phosphate: sources, uptake, excretion, function. Serum calcium regulation. Iron: sources, uptake and transport.

Heme and nonheme iron functions; deficiency. Iodine: Brief introduction to thyroxine synthesis. General functions of thyroxine. Fluoride: function, deficiency and excess. Indications of role of other minerals.

4. ENERGY METABOLISM

Overview: Outlines of glycolysis, pyruvate oxidation and citric acid cycle. Beta oxidation of fatty acids. Electron transport chain and oxidative phosphorylation. Ketone body formation and

utilization. Introduction glycogenesis, glycogenolysis, fatty acid synthesis, lipogenesis and lipolysis. Gluconeogenesis. Lactate metabolism. Protein utilization for energy. Glycogenic and ketogenic amino acids. Integration of metabolism.

5. SPECIAL ASPECTS OF METABOLISM

Importance of pentose phosphate pathway. Formation of glucuronic acid. Outlines of cholesterol synthesis and breakdown. Ammonia metabolism. Urea formation. Phosphocreatine formation. Transmethylation. Amines. Introduction to other function of amino acids including one carbon transfer. Detoxication: Typical reactions. Examples of toxic compounds. Oxygen toxicity.

6. BIOCHEMICAL GENETICS AND PROTEIN SYNTHESIS

Introduction to nucleotides; formation and degradation. DNA as genetic material. Introduction to replication and transcription. Forms and functions of RNA. Genetic code and mutation. Outline of translation process. Antimetabolites and antibiotics interfering in replication, transcription and translation. Introduction to cancer, viruses and oncogenes.

7. ENZYME AND METABOLIC REGULATION

Enzymes: Definition, classification, specificity and active site. Cofactors. Effect of pH, temperature and substrate concentration. Introduction to enzyme inhibitors, proenzymes and isoenzymes. Introduction to allosteric regulation, covalent modification and regulation by induction/repression.

Overview of hormones. Introduction to second messengers, cyclic AMP, calcium ion, inositol triphosphate. Mechanism of action of steroid hormones, epinephrine, glucagons and insulin in brief. Acid base regulation. Electrolyte balance.

8. STRUCTURAL COMPONENTS AND BLOOD PROTEINS

Connective tissue: Collagen and elastin. Glycosaminoglycans. Bone structure. Structure of membranes. Membrane associated processes in brief. Exocytosis and endocytosis. Introduction to cytoskeleton. Myofibril and muscle contraction in brief.

Haemoglobin: functions. Introduction to heme synthesis and degradation. Plasma proteins: classification and separation. Functions of albumin. A brief account of immunoglobulins. Plasma lipoproteins: Formation; function and turnover.

9. MEDICAL BIOCHEMISTRY

glycemic status. Hyperthyroidism and hypothyroidism: Biochemical evaluation. Hyperlipoproteinemias and atherosclerosis, Approaches to treatment. Jaundice: Classification

and evaluation. Liver function tests: Plasma protein pattern, serum enzymes levels. Brief introduction to kidney function tests and gastric function tests. Acid base imbalance. Electrolyte imbalance: evaluation. Gout, Examples of genetic disorders including lysosomal storage disorders, glycogen storage disorders, glucose 6- phosphate dehydrogenase deficiency, hemoglobinopathies, inborn errors of amino acid metabolism and muscular dystrophy (one or two examples with biochemical basis will be adequate). Serum enzymes in diagnosis.