**BIOCHEMISTRY**

**MID-1 SYLLABUS(2019-2020)**

**SEMESTER – I**

**BCT-101: BIOMOLECULES**

**Unit – I: Biophysical Concepts 12 hours**

Water as a biological solvent and its role in biological processes. Biological relevance of pH,

measurement of pH, pKa of functional groups in biopolymers such as proteins and nucleic

acids. Importance of buffers in biological systems, ion selective electrodes, and oxygen

electrode. Donnan membrane equilibrium. Significance of osmotic pressure in biological

systems,

**Unit – II: Carbohydrates 12 hours**

Carbohydrates: Classification, monosaccharides, D and L designation, open chain and cyclic structures,

epimers and anomers, mutarotation, reactions of carbohydrates (due to functional groups - hydroxyl ,

aldehyde and ketone). Amino sugars, Glycosides. Structure and biological importance of disaccharides

(sucrose, lactose, maltose, isomaltose, trehalose), trisaccharides (raffinose, melezitose), structural

polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen).

Glycosaminoglycans, Bacterial cell wall polysaccharides. Outlines of glycoproteins, glycolipids and

blood group substances.

**Unit – III: Lipids 12 hours**

Lipids: Classification, saturated and unsaturated fatty acids, structure and properties of fats and oils

(acid, saponificition and iodine values, rancidity). General properties and structures of phospholipids,

sphingolipids and cholesterol and lipoproteins.

**SEMESTER – III**

**BCT-301 Enzymology and Bioenergetics**

**Unit-I: Classification of Enzymes and Structure**

Introduction to biocatalysis, differences between chemical and biological catalysis. Nomenclature and

classification of enzymes. Enzyme specificity. Active site. Principles of energy of activation, transition

state. Interaction between enzyme and substrate- lock and key, induced fit models. Definition of holoenzyme,

apo-enzyme, coenzyme, cofactor. Fundamentals of enzyme assay, enzyme units.

**Unit II: Influence of Physical factors and Inhibitors on Enzyme activity.**

Factors affecting the catalysis- substrate concentration, *p*H, temperature. Michaelis - Menten equation

for uni-substrate reaction (derivation not necessary), significance of *K*M and Vmax. Enzyme inhibitionirreversible

and reversible, types of reversible inhibitions- competitive and non-competitive.

**Unit-III: Mechanism of enzyme action**

Outline of mechanism of enzyme action - acid-base catalysis, covalent catalysis, electrostatic catalysis,

and metal ion catalysis. Regulation of enzyme activity- allosterism and cooperatitvity, ATCase as an

allosteric enzyme, covalent modulation - covalent phosphorylation of phosphorylase, zymogen

activation - activation of trypsinogen and chymotrypsinogen. Isoenzymes (LDH). Multienzyme

complxes (PDH). Ribozyme .

**PAPER-V(A)**

 **PAPER -V**

**Unit- I : Physiology**

Digestion and absorption of carbohydrates, lipids and proteins. Composition of blood and coagulation of blood. Transport of gases in blood (oxygen and CO2). Muscle: Structure of myofibril and mechanism of muscle contraction.

**Unit II: Endocrinology 12 hours**

Endocrinology- organization of endocrine system. Classification of hormones. Outlines of chemistry, physiological role and disorders of hormones of hypothalamus, pituitary, thyroid, parathyroid, adrenal gland, pancreatic hormones and gonads. . Introduction of hormones of gastrointestinal tract and placenta.

**Unit- III : Nutritional Biochemistry 12 hours**

Classification of Nutrients, calorific values of foods and their determination by bomb calorimeter. BMR and factors affecting it. Significance of BMR. Specific dynamic action of foods[SDA].

**PAPER -V(B)**

**PAPER -VI**

**Theory: BCT-601- Molecular Biology and Recombinant DNA technology**

**Unit- I : DNA Replication and Transcription**

Nature and structure of the gene. DNA as genetic material . DNA replication- models of replication, Meselson-Stahl’s experimental proof for semi-conservative model. DNA polymerases I, II and III of *E.coli*, helicase, topoisomerases, primase, ligase. Mechanism DNA Replication in E.Coli . Inhibitors of DNA replication.

Transcription - RNA polymerases of prokaryotes, Mechanism of Transcription -. Initiation- sigma factors and their recognition sites, Promoters,. Elongation, Termination- rho dependent and rho independent. Inhibitors of Transcription .

**Unit- II: Protein Synthesis and Regulation of Gene Expression**

Genetic code : features of genetic code, wobble hypothesis, degeneracy of genetic code.

Protein synthesis- Ribosome structure,t-RNA , activation of amino acids (aminoacyl t-RNA synthetases). Initiation, elongation and termination of protein synthesis.

Post- translational modifications, signal hypothesis. Inhibitors of protein synthesis.

Regulation of prokaryotic gene expression- induction and repression. Ex: Lac operon in E.coli

**Unit- III: Recombinant DNA technology**

Basic steps in r-DNA technology. Tools of r-DNA technology: Enzymes- Restriction endonucleases, ligase, phosphatases, reverse transcriptase, polynucleotide kinases, terminal transferase nucleases-S1 and RNAase H. Restriction mapping. Cloning vectors- Plasmids, Cosmids, λ phages vectors