

SYLLABUS FOR LAB ASSISTANT (BIOCHEMISTRY)**PART-I**

UNIT-I:

BIOMOLECULE & HUMAN PHYSIOLOGY

Carbohydrates: Structure of monosaccharides, stereoisomerism and optical isomerism of sugars, reactions of aldehydes and ketone groups, ring structure and anomeric forms, mutarotation, chemical reactions of sugars, important derivatives of monosaccharides, di and tri-saccharides structure, occurrence and biological importance of monosaccharides, oligosaccharides and polysaccharides, eg. glycogen, starch, cellulose, blood group polysaccharides, insulin, chitin, glycosaminoglycans.

UNIT-II:

Lipids: Definition and classification, Fatty acids: introduction, classification, nomenclature, structure and properties of saturated and unsaturated fatty acids, essential fatty acids, triacylglycerols; nomenclature, physical properties, chemical properties and characterization of fats- hydrolysis, saponification value, acid value, rancidity of fats, Reichert- Meissel number and reaction of glycerol, biological significance of fats, Glycerophospholipids (lecithins, lysolecithins, cephalins, phosphatidyl serine, phosphatidyl inositol, plasmalogens), sphingomyelins, glycolipids- cerebrosides, gangliosides.

UNIT-III

A) Muscles: Structure of striated muscle fibre, Molecular organization of contractile system, Sliding mechanism of muscle contraction, neuromuscular junction.
B) Digestion, digestion and absorption of carbohydrates, fats, proteins.

(MICROBIOLOGY AND VIROLOGY)

UNIT-I

A) History and Development of microbiology: Controversy over spontaneous generation, Fermentation & Germ theory of diseases, Concept of immunization.

B) Microscopy; Compound Microscopy; parts of compound microscopy, Numerical Aperture & its importance. Resolving power, importance of oil immersion objective, Ray diagram of compound light microscope, Principles and applications of Dark field, Phase contrast, UV & Fluorescent microscopy. Electron microscopy; Principle and Ray diagram.

UNIT-II

A) Staining: Principles and technique of simple and differential staining (Gram, Acid-fast & Endospore staining).

B) Viruses; General characteristics of viruses. Virus structure. Basis of virus classification, detailed study of lytic cycle & Lysogeny.

UNIT-III

A) Classification of Microorganisms; Prokaryotes and Eukaryotes, Haeckel system, Whittaker system, Bergey's manual.

B) Bacteria; (i) Bacterial morphology & subcellular structures (General morphology of bacteria, shapes & sizes). (ii) Slime layer & capsule, (iii) Cell wall structure of Gm +ve & Gm -ve cells. (iv) General account of ribosome, Flagella & Fimbriae. (v) Chromatin materials, Plasmids and episomes. (vi) Endospore: Detailed study of endospore structure & its formation, Basis of resistance.

MICROBIOLOGY AND IMMUNOLOGY**UNIT-I**

Nutrition: (i) Basic nutritional requirements;(ii) Nutritional classification of bacteria; Phototrophs & chemotrophs, (iii) Pure cultures and method of obtaining pure cultures.

UNIT-II

Microbial control

(i) Terminology (ii) Factors influencing anti microbial activity (iii) Mechanisms of cell injury (iv) Physical control methods (v) chemical control methods (vi) Chemotherapeutic agents;- Sulphonamides and Antibiotics (vii) Standardization of disinfectant: Phenol coefficient.

UNIT-III

Immunology

A) The immune system:- Active and Passive immunity, organs and cells of the immune system & their functions.

B) Immunoglobulins:- Nature and general properties of antibodies, Antibody reactions & antibody binding sites, Antibody specificity, Haptens, Basic structure of IgG, Brief account of other types of antibodies,

UNIT-IV

Immunology

A)Clonal selection theory: Brief idea of Hybridomas and monoclonal antibodies, Preparation and its application.

B)Brief idea of Complement system.

C Brief account of cell mediated (Cellular) immunity & humoral (Noncellular) immunity.

PART-II**MACROMOLECULES****UNIT-I**

Proteins:- (a) Quick review of amino acids, physico-chemical properties of amino acids (Solubility, Boiling & melting points, Reactions like Edman's,Sanger's, Dansyl chloride, Ninhydrin & Formaldehyde). Unusual amino acids.

(b) Determination of primary structure of proteins

(c) Peptide, peptide mapping, Merrifield-Gutt synthesis.

UNIT-II

Proteins:- (a) Secondary structure of proteins:- The Helix, Pleated sheet structures. (b) Tertiary structure of proteins: Forces that stabilize the structure, concept of domains, protein denaturation (c) Quaternary structure of proteins: Subunit interaction (d) Structure and biological functions of Collagen.

UNIT-III

Nucleic acids:- (a) Chemical structure and base composition of nucleic acids, Chargaff's rules (b) Double helical structures, Watson- Crick Model (B- DNA), Deviations from Watson-Crick model, Other DNA helices (A- & Z- DNA).

(c) Forces stabilizing nucleic acid structures, Denaturation & Renaturation, Sugar phosphate chain conformation, Base pairing, Base stacking, Hydrophobic and ionic interactions.

UNIT-IV

Nucleic acids:-

a) T_m & buoyant density and their relationship with G-C content in DNA, satellite DNA.

b) DNA sequencing; Maxam-Gilbert & Sanger's dideoxynucleoside sequencing.

c) Structure of m-RNA, r-RNA & t-RNA.

ENZYMOLGY

UNIT-I

a) Classification & Nomenclature of enzymes, Specificity of enzymes action (Lock & Key model & Induced fit model).

b) Enzyme catalysis: Proximity & Orientation effect, covalent catalysis, acid-base catalysis, metal ion catalysis

c) Regulatory enzymes:- Allosteric (ATCase) & covalently modulated (Glycogen Phosphorylase) enzymes.

UNIT-II

a) Mechanism of action of Chymotrypsin and Ribonuclease.

b) Role of vitamins as coenzyme precursors (Riboflavin, Niacin, Pyridoxine, Biotin and Thiamine)

c) Effect of enzyme concentration, upward & downward curvatures with examples.

d) Effect of temperature on enzyme activity & temperature quotient.

UNIT-III

Enzyme Kinetics: Importance of measuring initial velocities, Derivation of Michaelis-Menten equation, Single & double reciprocal plots, Graphical representation of various inhibitors (Competitive, Noncompetitive & Uncompetitive) on Lineweaver-Burke plots, Importance of K_{cat} / K_m .

Bisubstrate reactions – brief introduction to sequential and ping-pong mechanisms with examples.

UNIT-IV

a) Effect of pH, General pH profile diagram with exceptions.

b) Concept of enzyme assay & its importance, Enzyme activity units (Katal & Specific activity)

c) Enzyme isolation and purification:- Enzyme solubilization, brief idea of various fractionation procedures, criteria for enzyme purity and homogeneity.

BIOPHYSICAL & BIOCHEMICAL TECHNIQUES

UNIT-I

Electrophoresis:-

a) Migration of ions in electric field, Factors affecting electrophoretic mobility.

b) Paper electrophoresis:- Electrophoretic run, Detection techniques, Cellulose acetate electrophoresis, High voltage electrophoresis, Applications.

c) Gel electrophoresis:- Types of gels, Solubilizers, Procedure, Column & slab gels, Detection, Recovery & estimation of macromolecules, Applications.

UNIT-II

Electrophoresis:- Disc- Gel electrophoresis:- Procedures & Applications.

a) SDS-PAGE electrophoresis:- Isoelectric focusing, Principle, Establishing Ph gradients, Stabilization against convection, Procedures & applications.

b) Immunological techniques:- Immunodiffusion, Immuno-electrophoresis, Radioimmunoassay, ELISA and immunofluorescence.