

COURSE OBJECTIVES:

To enable students to-

- Use various solvents, prepare different types of buffers based on need
- Identify and classify carbohydrates based upon their properties.
- Identify lipids and understand their physiological role
- Learn and interpret the various organizations of protein structure
- Correlate knowledge on nucleic acids with their physiological role and analyse quality of porphyrins and appreciate their biological significance

COURSE OUTCOMES:

Students will be able to-

1. Correlate the Physico - Chemical properties of Biomolecules to their structures
2. Compare and contrast the structure and functions of oligosaccharides and polysaccharides
3. Identify and establish the functional groups of Biomolecules such as Carbohydrates and Lipids
4. Explain the structure of peptide bond formation, and levels of protein structure
5. State the central dogma of molecular biology; recognize the structure of nucleic acids compare and contrast -DNA and RNA

UNIT-I Fundamentals of Biochemistry:

1.1 History, scope and avenues of Biochemistry.

1.2 Water as a biological solvent.

1.3 Measurement of PH, Buffers, Biological relevance of Buffers.

1.4 Outlines of surface tension, adsorption and osmosis and their biological relevance.

UNIT-II Carbohydrates:

2.1 Classification, monosaccharides, D and L designation, open chain and cyclic structures, epimers and anomers, mutarotation.

2.2 Reactions of carbohydrates (due to functional groups - hydroxyl, aldehyde and ketone. Amino sugars, Glycosides.

2.3 Structure and biological importance of disaccharides (sucrose, lactose, maltose, isomaltose, trehalose), trisaccharides (raffinose, melezitose).

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

UNIT – III Lipids:

- 3.1 Classification, saturated and unsaturated fatty acids, structure and properties of fats and oils (acid, saponification and iodine values, rancidity).
- 3.2 General properties and structures of phospholipids.
- 3.3 Prostaglandins- structure, types and biological role.
- 3.4 Lipoproteins- types and functions.

UNIT-IV Amino Acids and Proteins:

- 4.1 Classification, structure, stereochemistry, chemical reactions of amino acids due to carbonyl and amino groups.
- 4.2 Titration curve of glycine and pK values.
- 4.3 Essential and nonessential amino acids, non-protein amino acids.
- 4.4 Peptide bond - nature and conformation.
- 4.5 Naturally occurring peptides - glutathione, enkephalin. Proteins:
- 4.6 Classification based on solubility, shape, and function.
- 4.7 Determination of amino acid composition of proteins.
- 4.8 General properties of proteins, denaturation, and renaturation of proteins.
- 4.9 Structural organization of proteins- primary, secondary, tertiary, and quaternary structures (Eg. Hemoglobin and Myoglobin).

UNIT-V Nucleic acids and porphyrins:

- 5.1 Types of RNA and DNA. Structure of purines and pyrimidines, nucleosides, nucleotides.
- 5.2 Stability and formation of phosphodiester linkages.
- 5.3 Effect of acids, alkali and nucleases on DNA and RNA.
- 5.4 Structure of Nucleic acids- Watson-Crick DNA double helix structure, denaturation and renaturation of nucleic acids,
- 5.5 T_m-values and their significance, cot curves and their significance.
- 5.6 Structure and properties of porphyrins: Heme, cytochromes and chlorophylls.

II SEMESTER
Course No-3 BIO MOLECULES
Credits -1

COURSE OBJECTIVES

To enable students to –

- Learn qualitative analysis of monosaccharides and disaccharides
- Prepare buffers as per the need of the experiment
- Analyse amino acids and lipids Qualitatively
- Analyse protein sample by various methods
- Determine amino acid and protein composition of samples quantitatively

COURSE OUTCOMES

Student will be able to-

- Prepare buffers selectively as per the need of the experiment or biomolecule
- Differentiate carbohydrate by using qualitative tests
- Establish methods to differentiate various amino acids
- Analyse the quality of a given oil
- Develop absorption spectra for proteins and DNA and quantitate them

List of Experiments

1. Preparation of buffers (acidic, neutral, and alkaline) and determination of pH.
2. Qualitative identification of carbohydrates- glucose, fructose, ribose/xylose, maltose, sucrose, lactose, starch/glycogen.
3. Qualitative identification of amino acids- histidine, tyrosine, tryptophan, cysteine, arginine.
4. Qualitative identification of lipids- solubility, saponification, acrolein test, Salkowski test, Lieberman-Burchard test.
5. Preparation of Osazones and their identification
6. Estimation of proteins in biological samples:
 - a. Biuret method.
 - b. Folin-Lowry method.
 - c. UV method.
 - d. Bradford's dye binding method
7. Estimation of amino acid by Ninhydrin method.
8. Estimation of tyrosine by Million's –reaction

Recommended Books

1. Fundamentals of Biochemistry –Jain, J.L., Jain, S., Jain, N. S. Chand & Co.
2. Biochemistry – Satyanarayana. U and Chakrapani. U, Books & Allied Pvt. Lt
3. Nelson.D.L. and Cox.M..M -Lehninger's Principles of Biochemistry- Freeman & Co.- 7 th Edition