

SEMESTER - 1st
MAJOR / MINOR COURSE

BCH122M: BIOCHEMISTRY (BIOMOLECULES)

CREDITS: THEORY - 04; PRACTICALS: 02

Course Objective:

The main objective of the course is to provide students with an understanding of biomolecules, the basic building blocks of living organisms, mainly focusing on their structural, biological roles and/or functions. The course will emphasise on structure and function of various biomolecules at molecular and cellular level. Further, the course will give students an opportunity to learn basic laboratory techniques.

Course Learning Outcome:

Upon completion of this course students will be:

- Well versed with molecular and cellular foundations of life
- Able to comprehend the structure, function and biochemical properties of monosaccharides, proteins and lipids
- Able to prepare various laboratory solutions and independently identify various biomolecules in the laboratory

Course Content:

Unit I: Carbohydrates (15 HOURS)

Definition, classification and structure of monosaccharides. Open and Ring structure, anomeric and epimeric forms, mutarotation. Reaction of monosaccharides with special reference to glucose, Structure and functions of important oligosaccharides Polysaccharides- Homo and Heteropolysaccharides; Structure and functions of important polysaccharides-Glycogen, Starch and Cellulose. Structure and role of glycoconjugates - proteoglycans, glycoproteins and glycolipids (gangliosides and lipopolysaccharides).

Unit II: Proteins (15 HOURS)

Amino acids: Structure & their classifications, stereoisomerisms and RS system of designation, optical isomers. Zwitter ion, PI and its biological significance.

Proteins: classification, composition and functions. Structure of peptide bond, chemical synthesis of polypeptides. Levels of structure in protein architecture, forces stabilizing the tertiary structure and quaternary structure of proteins. Denaturation and renaturation of proteins, Structure and function of Hemoglobin and myoglobin

Unit III: Lipids (15 HOURS)

Introduction, classification, nomenclature, structure and properties of Fatty acids. Saturated and unsaturated fatty acids. Essential fatty acids, chemical properties and characterization of fats – hydrolysis, Saponification value, Reichert – Meissel number, Iodine number, rancidity of fats, Triacylglycerols, Cholesterol and prostaglandins. Structure and functions of phospholipids and sphingolipids. Synthesis of steroid hormones.

Unit IV: Nucleic Acids (15 HOURS)

Structure and compositions Nucleic acids -RNA and DNA, Purines and Pyrimidines, Nucleoside, Nucleotide, Nucleic acid structure – Watson-Crick model of DNA, forms of DNA; Structure and function of major species of RNA - mRNA, tRNA and rRNA. Denaturation and renaturation of DNA, Cot curve.

PRACTICAL (2 CREDITS: 60 HOURS)

MAX.MARKS: 30

MIN. MARKS: 12

1. Safety measures in laboratories
2. Preparation of a solution (molar, normal and percent)
3. Preparation of Standard buffers and determination of pH of a solution
4. Qualitative tests for Carbohydrate
5. Qualitative tests for Amino acids
6. Qualitative tests for Lipids

7. Quantitative estimation of proteins

Books Recommended

1. Principles of Biochemistry by Lehninger, Nelson & Cox
2. Biochemistry by Lubert Stryer
3. Biochemistry by Dr Satyanarayan
4. Experimental Biochemistry by B A Ganai