

SEMESTER – I
MOLECULES OF LIFE
THEORY

Programme: B.Sc.
Course Code: U20/BIC/DSC/101
Type of course: DSC - 1
No. of credits: 4

Max. Hours: 60
Hours per week: 4
Max. Marks: 100

Course Objective:

Introduce the basic molecules of life with regard to the structures, properties, functions and classification.

Course Outcomes:

- CO1:** Understand in detail the structure, physico-chemical properties and significance of carbohydrates from monosaccharide to polysaccharides.
- CO2:** Learn the structures of amino acids, reactions of amino acids, protein classification, different levels of organization of proteins.
- CO3:** Understand the structure and function of lipids, fatty acids and lipoproteins.
- CO4:** Gets clear knowledge on nucleic acids, different forms and denaturation of DNA and types of RNA.

MODULE I: CARBOHYDRATES**(15 Hrs)**

Carbohydrates : Classification & Nomenclature, Monosaccharides, D & L designation, open chain & cyclic structures, Stereochemistry of monosaccharides – optical isomers, mutarotation, Reactions of carbohydrates due to functional groups – hydroxyl, aldehyde & ketone, Amino sugar, glycosides.

Disaccharides – structure of maltose, isomaltose, sucrose, lactose & cellobiose.

Classification of Polysaccharides

- Based on composition –
Homopolysaccharides Starch, glycogen, Inulin, Cellulose, Pectin, Chitin, Agar – Agar
Heteropolysaccharides – Hyaluronic acid, chondroitin sulphate, Heparin.
- Based on function – Structural Polysaccharides & Storage Polysaccharides.
re, occurrence, biological importance of Bacterial cell wall polysaccharides.

MODULE II: PROTEINS**(15 Hrs)**

Amino acids & Peptides, Amino acid classification, Structure & Stereochemistry, Optical Isomerism of Amino Acid. Reactions of amino & carboxyl groups of amino acids.

Essential & Non – essential amino acid, Nonstandard & Non – Protein amino acid

Peptide bond. Nature & conformation, Ramachandran plot

Proteins: Classification based on solubility, structure, function & composition of proteins.

Biological role of proteins. Structural organization of proteins - Primary, Secondary, Tertiary & Quaternary Structures (forces stabilizing the structure of protein). Denaturation of protein structure

Structure & Function of fibrous Proteins – collagen, elastin & keratin. Structure & function of globular proteins – hemoglobin & myoglobin. End group analysis pertaining to protein sequencing

(Edman degradation & Sanger's method (Dansyl chloride, Dabsyl chloride & FDNB))

MODULE III: LIPIDS**(15 Hrs)**

Classification, distribution and general properties,

Structure and biological importance of lipids - simple lipids, compound lipids and derived lipids

Fatty acids – classification, structure, nomenclature, physical and chemical properties

Saturated and Unsaturated fatty acids; Essential fatty acids and non-essential fatty acids, Saponification value, Iodine number, Acid value, Rancidity of oils and fats.

General properties and structures of phospholipids, sphingolipids and cholesterol.

Lipoproteins – Types and functions.

MODULE IV: NUCLEIC ACIDS**(15 Hrs)**

Nature of Nucleic acids. Structure of purines, pyrimidines, nucleosides, nucleotides.

DNA, RNA. Stability and formation of phosphodiester linkage. Effect of acids, alkali and nucleases on DNA and RNA. Watson – Crick double helix structure.

Different forms of DNA – A, B, Z. Introduction to Circular DNA, Supercoiling, denaturation of DNA – hyperchromic effect, T_m values and their significance. Cot curves and their significance.

Packaging of DNA. Different types of RNA.

Reference Books:

1. Dr. U.Satyanarayana and U.Chakrapani Biochemistry 5th ed. (2001). Elsevier (New Delhi), Books and Allied Private Limited. ISBN: 81-87134-80-1.
2. J.L.Jain : Fundamentals of Biochemistry, (2001), S. Chand & Company (New Delhi).
3. Albert L. Lehninger: Principles of Biochemistry (2013) 6th ed. Nelson, D.L. and Cox, M.M.W.H. Freeman and Company (New York).
4. Jeremy M Berg, John L Tymoczko, and Lubert Stryer Biochemistry, 5th ed W H Freeman; (2002) ISBN-10: 0-7167-3051-0.
5. Dr. A.C Deb: Fundamentals of Biochemistry, (1999), New Central Book Agency Private Limited. ISBN : 81-7381-144-X.

MOLECULES OF LIFE
MODEL QUESTION PAPER
THEORY

Course Code: U20/BIC/DSC/101
Credits: 4

Max Marks: 60
Time: 2 Hrs

SECTION – A

I. Answer the following

4 x 10 = 40 M

1. Define carbohydrates. Give their classification with suitable examples indicating their Structures

OR

2. Discuss the reactions of monosaccharides.

3. Enumerate the forces that stabilize the tertiary & quaternary structure of proteins.

OR

4. How do you determine the N & C terminal amino acid of a peptide?

5. Explain the structural features & functions of phospholipids.

OR

6. Discuss the reactions of fatty acids & add a note on their biological importance.

7. Explain Watson & Crick model of DNA double helix.

OR

8. Describe the three levels of chromatin organization in a eukaryotic cell.

SECTION – B

II. Answer any FOUR

4 x 5 = 20 M

- 9. Supercoiling of DNA
- 10. Mutarotation
- 11. Denaturation of proteins
- 12. Cholesterol
- 13. Porphyrins
- 14. Peptide Bond