GENERIC ELECTIVE (GE-1: MOLECULES OF LIFE)

Credit distribution, Eligibility and Pre-requisites of the Course

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Molecules of Life GE 1	4	2	0	2	Class XII Science	NIL

Learning Objectives

The objective of the course is to provide students with an understanding of biomolecules, the basic building blocks that are vital for various life forms. The course emphasizes on studying the importance of water as a biological solvent, different types of molecules of life, focusing on their key properties, biological roles and functions. The course also aims to outline chemical and physical aspects of biomolecules by hands on approach through laboratory experiments.

Learning outcomes

- The course will provide an understanding of how the structures of biomolecules determine their chemical properties and functions.
- Students will develop understanding of biochemistry at atomic level and appreciate the biological importance of molecules of life.
- Students will gain insight into basic structures, classification, and biological importance of amino acids, carbohydrates, lipids and nucleic acid.

SYLLABUS OF GE - 1

THEORY

Unit – 1 **(2 Hours)**

Water and Concept of Buffer: Chemistry of water and biological importance of water, Henderson-Hasselbalch equation, concept of buffer and buffering capacity.

Unit – 2 **(6 Hours)**

Structure and functions of Amino Acids: Introduction and classification of amino acids, peptide bond, zwitterions, L and D form of amino acids, standard and non-standard amino acids and their biological importance.

Unit – 3 **(7 Hours)**

Biochemistry of Carbohydrates: Introduction, and classification of carbohydrates. Monosaccharides, disaccharides, polysaccharides (glycogen, starch, cellulose and chitin). D-and L- isomerism, epimers, and anomers. Carbohydrates as fuel and structural molecules, antigens and cell recognition unit.

Unit – 4 **(7 Hours)**

Lipids in Biological system: Introduction and classification of lipids. Fatty acids (PUFA, MUFA) triacylglycerol, phospholipids, sphingolipids, glycolipids, and cholesterol. Role of lipids as storage fuel, hormones, vitamins, in signaling and in membranes.

Unit – 5 **(8 Hours)**

Structure and Organization of Nucleic acids: Introduction, purine and pyrimidine bases, nucleosides, nucleotides, and nucleic acid. Structure and functions of DNA (B form), organization of DNA into chromatin; RNA structure and functions. Biologically important nucleotides (cAMP and ATP).

PRACTICAL **(60 Hours)**

1) Laboratory safety and preparation of solutions (molar, normal and %).
2) Concept of pH and working of pH meter
3) Preparation of acetate buffer and phosphate buffer.
4) Properties and analysis of amino acids (Ninhydrin, and Xanthoproteic)
5) Test for carbohydrates (Molisch, Fehling/ Benedict, Seliwanoff's)
6) Qualitative analysis of nucleic acids (Orcinol and Diphenyl amine)

ESSENTIAL/ RECOMMENDED READINGS

1) Nelson, D.L. and Cox, M.M. (2017). Lehninger: Principles of Biochemistry (7th ed.). W.H. Freeman & Company (New York), ISBN:13: 9781464126116 / ISBN:10-1464126119.
2) Plummer D.T. (1998). An Introduction to Practical Biochemistry (3rd ed)., Tata McGraw Hill Education Pvt. Ltd. (New Delhi), ISBN:13: 978-0-07-099487-4 / ISBN:10: 0-07-099487-0.
3) Pratt, C.W. and Cornely, K. (2017). Essential Biochemistry (4th ed.) John Wiley& Sons, Inc.ISBN:9781119012375

SUGGESTIVE READING:

1) Berg, J.M., Tymoczko J.L. and Stryer L. (2011). 7th Edition. Biochemistry. New York, USA: W. H. Freeman and Co. ISBN-13: 978142927635.

2) Campbell, M.K. and Farrel, S.O. (2017). 9th Edition. Biochemistry. Boston, USA: Brooks/Cole Cengage Learning. ISBN-13: 978-1305961135.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.