

SHYAM LAL COLLEGE**Teaching Plan 2024-25****B.Sc. Chemistry (H), V Semester,****Nucleic acids, Amino acids, Proteins and Enzymes: Dr Raghavender M**

Week	Dates From – To	Topic
1.	1/08/2024 - 3/08/2024	Introduction of the subject, UNIT 1-Nucleic Acids- introduction
2.	05/08/2024- 10/08/24	Structure of components of nucleic acids: Bases, Sugars, Nucleosides and Nucleotides.
3.	12/08/2024 - 17/08/2024	Nomenclature of nucleosides and nucleotides, structure of polynucleotides (DNA and RNA)
4.	19/08/2024 - 24/08/2024	Factors stabilizing, biological roles of DNA and RNA; Concept of heredity: Genetic Code, Replication, Transcription and Translation.
5.	26/08/2024 - 31/08/2024	Unit II Amino Acids, Peptides and Proteins. Amino acids and their classification; α -amino acids - Synthesis, ionic properties, and reactions.
6.	02/09/2024 - 07/09/2024	Zwitterions, pKa values, isoelectric point, and electrophoresis; Study of peptides
7.	09/09/2024- 14/09/2024	Determination of their primary structure-end group analysis
8.	16/09/2024 - 21/09/2024	Synthesis of peptides using N-protecting, C-protecting and C-activating groups
9.	23/09/2024 - 28/09/2024	Solid-phase synthesis; Overview of primary, secondary and tertiary structures of proteins, protein denaturation.
10.	30/09/2024 - 05/10/2024	Test for unit 1, 2 & Unit III- Enzymes- Introduction,
11.	07/10/2024 - 12/10/2024	Classification, and characteristics of enzymes. Salient features of active site of enzymes.
12.	14/10.2024- 19/10/2024	Mechanism of enzyme action (taking trypsin as an example), factors affecting enzyme action,
13.	21/10/2024- 25/10/2024	Coenzymes, and cofactors (including ATP, NAD, FAD),.
14.	27/10/2024 - 3/11/2024	Mid- semester break

15.	04/11/2024 - 09/04/2024	Specificity of enzyme action (including stereospecificity).
16.	11/11/2024 - 16/11/2024	Enzyme inhibitors and their importance
17.	18/04/2024 - 23/04/2024	Phenomenon of inhibition (competitive, uncompetitive, and non-competitive inhibition including allosteric inhibition)
18.	25/11/2024 - 28/11/2024	Test for unit 3 and presentations for internal assessment and Remedial class

DISCIPLINE SPECIFIC CORE COURSE - 14 (DSC-14): Nucleic Acids, Amino Acids, Proteins and Enzymes

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 (if any)
		Lecture	Tutorial	Practical/ Practice		
Nucleic Acids, Amino Acids, Proteins and Enzymes (DSC-14, Organic Chemistry- V)	04	02	--	02	Class 12 th with Physics, Chemistry	--

Learning Objectives

The objectives of this course are as follows:

- To familiarize students with the fascinating chemistry and biology of biomolecules, *i.e.*, nucleic acids and proteins etc..
- To develop the interest of students in the basic concepts of heredity, which are imparted through replication, transcription, and translation processes.
- To discuss basic fundamentals of enzyme action and inhibition, which forms the basis of drug action.

Learning outcomes

By studying this course, the students will be able to:

- Demonstrate how structure of biomolecules determines their reactivity and biological role.
- Gain insight into concepts of heredity through the study of genetic code, replication, transcription, and translation
- Demonstrate basic understanding of enzyme action and role of inhibitors
- Use knowledge gained to solve real world problems.

SYLLABUS OF DSC-14

Unit-1: Nucleic Acids

(Hours: 8)

Structure of components of nucleic acids: Bases, Sugars, Nucleosides and Nucleotides. Nomenclature of nucleosides and nucleotides, structure of polynucleotides (DNA and RNA) and factors stabilizing them, biological roles of DNA and RNA; Concept of heredity: Genetic Code, Replication, Transcription and Translation.



Unit-2: Amino Acids, Peptides and Proteins

(Hours: 14)

Amino acids and their classification; α -amino acids - Synthesis, ionic properties, and reactions. zwitterions, pKa values, isoelectric point, and electrophoresis; Study of peptides: determination of their primary structure-end group analysis; Synthesis of peptides using N-protecting, C-protecting and C-activating groups, Solid-phase synthesis; Overview of primary, secondary and tertiary structures of proteins, protein denaturation.

Unit-3: Enzymes

(Hours: 8)

Introduction, classification, and characteristics of enzymes. Salient features of active site of enzymes. Mechanism of enzyme action (taking trypsin as an example), factors affecting enzyme action, coenzymes, and cofactors (including ATP, NAD, FAD), specificity of enzyme action (including stereospecificity). Enzyme inhibitors and their importance, phenomenon of inhibition (competitive, uncompetitive, and non-competitive inhibition including allosteric inhibition).

Practical component

Practical:

Credits: 02

(Laboratory periods: 15 classes of 4 hours each)

1. Study of the titration curve of glycine.
2. Estimation of glycine by Sorenson Formol Titration
3. Qualitative analysis of proteins- Ninhydrin test, Biuret test, Millon's reagent test, Xanthoproteic test.
4. Estimation of proteins by Lowry's method.
5. Study of the action of salivary amylase on starch at room temperature.
6. Effect of temperature on the action of salivary amylase.
7. Effect of pH on the action of salivary amylase
8. Study the inhibition of α -Amylase by copper sulphate
9. Isolation and estimation of DNA using cauliflower/onion.

Essential/recommended readings

Theory:

1. Berg, J.M., Tymoczko, J.L., Stryer, L. (2019), **Biochemistry**, Ninth Edition W.H. Freeman and Co.
2. Nelson, D.L., Cox, M.M., Lehninger, A.L. (2017), **Principles of Biochemistry**. W.H. Freeman and Co., International Edition.
3. Murray, R.K., Granner, D.K., Mayes, P.A., Rodwell, V.W. (2009), **Harper's Illustrated Biochemistry**. Lange Medical Books/McGraw-Hill.
4. Brown, T.A. (2018), **Biochemistry**, (First Indian Edition) Viva Books.
5. Kuashik, S., Singh, A. (2023), **Biomolecules: From Genes to Proteins**, First Edition, Berlin, Boston: De Gruyter.
6. Voet, D., Voet, J.G. (2010), **Biochemistry**, Fourth Edition, Wiley.