

St. Xavier's College (Autonomous), Ahmedabad
Syllabus of Semester – I of the following departments under Faculty of Science
based on Under Graduate Curriculum Framework – 2023 (NEP)
to be implemented from the Academic Year 2023-24.

FACULTY OF SCIENCE

DEPARTMENT OF BIOCHEMISTRY

Course	Title	Content	Hours/Week	Credit
Minor-I (Theory+ Lab)	BC – 1101 Theory: Fundamentals of Biochemistry	U-1: Scope of Biochemistry and Origin of Life U-2: Biomolecules in living systems	2 hrs	2
	Lab: Laboratory Analysis of Carbohydrates	Practical based as per Theory syllabus	4 hrs	2

BSC. (HONS.) BIOCHEMISTRY SYLLABUS

SEMESTER - I

Minor Course – 1: Fundamentals of Biochemistry

For Chemistry Major Students

Course Title & Code	Credit Distribution of The Course			Eligibility Criteria	Pre-requisite(s) of the Course (if any)
	Lecture	Tutorial	Practical / Practice		
BC – 1101: Fundamentals of Biochemistry	2 (30 hr)	0	2 (60 hrs)	10 + 2 from a recognized board in any stream	Nil

I. Course Learning Objectives

The course has been structured to enable students to relate biomolecules and life. The learning from this course work can help in the following:

- a. Relate the structure of biomolecules with its functions in the biological systems
- b. Comprehending their relevance as commercial products
- c. Relate the balance of these molecules in the body and its implications on health and day to day activities.
- d. Develop a skill set to identify biomolecules in given samples.

II. Course Learning Outcomes

The main outcome of the course will be to build the basic foundation for studying biochemistry. By the end of the paper, a student should be able to:

- CO 1: To integrate experiments and evidences to deduce origin of life
- CO 2: To establish how proper conformations are needed for optimum functioning of the molecules and thereby the entire cell
- CO 3: To analyze how biomolecules contribute to structural integrity of the cell as well as the biochemical reactions and a change in the structure of the molecules can lead to abnormalities, for eg. A mutated globin results in sickle cell anaemia
- CO 4: Applying the principles and protocols to analyze biomolecules in given samples.

III. Course Content

Part A: Theory

III A.

Unit 1: Scope of Biochemistry and Origin of life

What is biochemistry, development of biochemistry, what is biochemical approach, scope of biochemistry, applications of biochemistry, Careers in biochemistry, Biochemical literature (How to conduct a literature search and read a research article.

Origin of life: Living matter, early history, Chemical evolution, Origin of living systems (molecules to first cell), RNA world, development of metabolic pathways, Central dogma of life, mutation and evolution. Biological evolution: prokaryotes to eukaryotes; Differences between plant and animal cells; Types of cells.

Unit 2: Biomolecules in Living Systems

Introduction, natural occurrence and physiological importance and functions;

1. Carbohydrates: Simple sugars, Oligosaccharides, Amino sugars, Deoxysugars, sugar phosphates, blood group polysaccharides, cell wall polysaccharides, teichoic acid, muramic acid, sialic acid, mucopeptides, starch, cellulose, hemicellulose, dextrin, chitin, inulin, dextran, pectin, agar, alginic acid, mannans, glycoproteins, glycosaminoglycans, glycolipids, proteoglycans.
2. Proteins: Peptides – structure, formation and characteristics of peptide bond; Structure of proteins – primary, secondary, super secondary, tertiary and quaternary structures; Biological functions of fibrous proteins, keratins, collagen, elastin, globular proteins – haemoglobin, myoglobin, glycoproteins, lipoproteins, nucleoproteins and metalloproteins.

- Lipids: Lipids: Introduction, classification of lipids, fatty acids. Structure, properties, functions and importance of saturated, unsaturated, hydroxyl, cyclic, branched chain fatty acids and PUFA; Complex lipids and Sterols: Glycerophospholipids – classification, properties and functions of lecithin, lysolecithin, cephalins, plasmalogens, phosphatidyl serine, phosphatidyl inositol; Sphingolipids: Classification, properties and functions of cerebrosides, gangliosides; Sulpholipids, gangliosides, proteolipids and prostaglandins; Structure and properties of sterols; Colour reactions of cholesterol.
- Nucleic Acids: Basic structure and functions of nucleotides, DNA and RNA

III B. Recommended Learning Resources

- [Biochemistry, 5th Edition](#). Garrett and Grisham
- [Biochemistry, 3rd Edition](#). Matthews, van Holde, and Ahern
- Biochemistry. 7th edition. Berg JM, Tymoczko JL, Stryer L. New York: W H Freeman;
- Lodish et al. Molecular Cell Biology. 8th Edition. W. H. Freeman and Company.
- Textbook of Biochemistry with Clinical Correlations, 7th Edition by T. Devlin
- Voet, D. and Voet, J.G. (2012) : Biochemistry 4th ed., (John Wiley & Sons Inc/, New York)
- Harpers Review of Biochemistry, 25th Edition. Murray RK, Rodwell VW.
- Lehninger's Principles of Biochemistry, Nelson and Cox (2012) : Principles of Biochemistry (Worth Publ. Inc. USA)
- [Biochemistry, 4th Edition. U. Satyanarayana and U. Chakrapani. Elsevier; 2013](#)

III C. Pedagogy

- Classroom engagement through lectures and PowerPoints
- Lecture videos and online resources
- Workbooks/Group activities/Assignments/Class Tests

III D. Evaluation

The course paper is evaluated out of 50 marks, of which 50 percent weightage is of Internal Assessment and 50 percent weightage is of the End semester examination (External)

ASSESSMENT CRITERIA	INTERNAL EVALUATION	EXTERNAL EVALUATION
Continuous Internal Assessment (CIA) I and II	15	-
Assignment	05	-
Attendance	05	-
End Semester Exam	-	25
Total	25	25

**The assignment comprises searching literature or experiments carried out by scientists or labs across the globe elucidating the structural and functional aspects of biomolecules, and then representing the findings as a report or article or presentation or poster.*

Part B: Lab sessions

III E. Laboratory Experiments

Qualitative Analysis

1. Qualitative tests for monosaccharides.
2. Qualitative tests for Disaccharides
3. Qualitative tests for Polysaccharides
4. Qualitative tests for mixture of sugars
5. Quantitation of sugar in samples by Cole's method
6. Qualitative analysis of lipids
7. Qualitative analysis of proteins

III F. Recommended Learning Resources

1. Concepts in Biochemistry, 3rd Edition. Rodney Boyer
2. [Introduction to Practical Biochemistry. T. Plummer.](#)
3. [Textbook of Biochemistry, 4th Ed. West and Todd.](#)

III G. Pedagogy

1. Explanation of each laboratory experiment emphasising on the use of different reagents and instruments
2. Problem solving, group activities and presentations. There are defined activities for every laboratory experiment in the journal, which encourages self-learning, peer learning, team work, developing presentation skills and reading from science articles and research papers.
3. Learning outcome based questions, which develops reading and writing skills and lab tests

III H. Evaluation

The course paper is evaluated out of 50 marks, of which 50 percent weightage is of Internal Assessment and 50 percent weightage is of the End semester examination (External)

ASSESSMENT CRITERIA	INTERNAL EVALUATION	EXTERNAL EVALUATION
Internal Practical Examination*	20	-
Attendance	05	-
End Semester Practical Exam	-	25
Total	25	25

**The internal practical exam will entail the students to answer a question paper based on the experiments in their journal, to perform one experiment. The journal duly completed and signed will also carry weightage in the end semester evaluation.*