

Shri Manibhai Virani and Smt. Navalben Virani Science College, Rajkot
(An Autonomous College affiliated to Saurashtra University, Rajkot)

Department of Biochemistry
Bachelor of Science (Hon/Hon with Research (FYUGP))
For the students admitted from A.Y. 2023-2024 & onwards
NCrF- Level 4.5: First Year FYUGP: Semester I & II (UG Certificate in Sciences)

Syllabus Semester I

Foundation Course		
For the students admitted from A.Y. 2023-2024 & onwards		
Offering Department: Biochemistry	Offered to: B.Sc Biochemistry	
Semester – I		
Course Code	Course Title (F)	Course Credit and Hours
23UBCCC101	Biomolecules	4 Credits - 4 hrs/wk

Course Description:

This course on Biomolecules is one of the basic courses for all students of Biological Sciences. It covers foundation of life. The course will outline the importance of water as a biological solvent and vitamins as vital ingredients of life. Emphasis will be on the association between structure and functions of various biomolecules at a chemical level with a biological perspective as well as hands on approach and laboratory techniques.

Course Purpose:

This course is designed to introduce the organic structure of living systems mainly dealing with biomolecules like carbohydrates, lipids, nucleic acids, etc. laying the foundation for other advanced courses like Physiology, Cell Biology, Bio-analytical Techniques, Molecular biology, Metabolism and Immunology.

Course Outcomes: Upon completion of this course, the learner will be able to

CO No.	CO Statement	Blooms taxonomy Level (K ₁ to K ₆)
CO ₁	Classify, recognize and illustrate the structures of biomolecules	K ₁ , K ₂ , K ₃

CO ₂	Understand and interpret properties of biomolecules	K ₁ , K ₂ , K ₃
CO ₃	Examine and interpret the biochemical reactions of carbohydrates and lipids	K ₁ , K ₃
CO ₄	Express importance of vitamins and porphyrins in biology	K ₁ , K ₂
CO ₅	Understand the structure of nucleic acids, acknowledge the contribution of scientists and illustrate experiments demonstrating nucleic acid as genetic material	K ₁ , K ₂ , K ₃ ,

Course Content	Hours
Unit I: Carbohydrates and glycobiology	12hrs
<ul style="list-style-type: none"> • Monosaccharides –Occurrence, structure, functions and properties • Formation of disaccharides, reducing and nonreducing disaccharides. • Polysaccharides –types, structure and functions • Proteoglycans, glycoproteins and glycolipids–types, structure and functions 	
Unit-II: Amino acids and Proteins.	12 hrs
<ul style="list-style-type: none"> • Structure and classification of amino acids. • Biologically important amino acids (standard and non standard) • Physical and chemical properties of proteins. • Primary (peptide conformation, N- and C- terminal,), Secondary (α-helix, sheet, random coil), Tertiary and Quaternary structures of proteins. • Functional classification of Proteins. 	
Unit- III: Lipids	12 hrs
<ul style="list-style-type: none"> • Building blocks of lipids - fatty acids, glycerol, sphingolipids • Classification of lipids • Storage lipids (triacylglycerol) and waxes. • Structural lipids in membranes – glycerophospholipids, galactolipids and sulpholipids, sphingolipids • Sterols, structure, distribution and role of membrane lipids. 	
Unit- IV: Nucleic acids	12 hrs
<ul style="list-style-type: none"> • Experimental evidences to reveal nature of Genetic material • Chemical elements and components of Nucleic Acids • Nucleic acid structure – Watson-Crick model of DNA, Different forms of DNA • Nucleic acid chemistry- UV absorption, effect of acid and alkali on DNA. • Structure of major species of prokaryotic and eukaryotic RNA • Molecular structure of prokaryotic and eukaryotic chromosome 	
Unit- V: Vitamins and Porphyrins	12 hrs

<ul style="list-style-type: none"> • Classification of vitamins: water soluble and fat soluble vitamins • Overview of structure and active forms, source, daily requirements, deficiency diseases and hypervitaminosis. • Porphyrins: Porphyrin nucleus and classification of porphyrins. Important metallo-porphyrins occurring in nature. • Heme synthesis and heme breakdown. Bile pigments- chemical nature and their physiological significance. • Spectrophotometric detection and quantification of porphyrins 	
--	--

Text books (2 textbooks):

- Satyanarayana, U., & Chakrapani, U. (2008). Essentials of biochemistry. *Book and Allied, Kolkata, India*.
- Jain, J. L. Sunjay Jain and Nitin Jain (2004). Fundamentals of biochemistry. S. Chand Publishing, New Delhi.

Reference books (2 or 3 reference books):

- Nelson, D. L., & Cox, M. M. (2013). Lehninger Principles of Biochemistry. [6th edition] Freeman and Company, New York.
- Berg, J. M., Tymoczko, J. L., Gatto G.J. & Stryer, L., (2015) Biochemistry, [8th Revised edition] W H Freeman, New York.
- Devlin, T. M. (Ed.). (2010). Textbook of biochemistry: with clinical correlations. 7th Edition, John Wiley & Sons, New York.

Pedagogic tools:

- Chalk and Board
- Power point presentation
- Seminar
- Videos

Methods of Assessment & Tools:

Components of CIE: 40 marks (Example as below)

Sr. No.	Component	Content	Duration (if any)	Marks	Sub Total
A	Test 1	1 st 2 units	1 ^{1/2} hours	5 (Set for 30)	20
	Test 2	3,4, 5 units	3 hours	15 (Set for 60)	
B	Assignment			5	10
C	Class activity			5	

Grand Total		30
Assignment	<ul style="list-style-type: none"> • Abstract and executive summary • Case study writing • Concept mapping • Student generated handbook • Essay writing etc. 	
Class activity	<ul style="list-style-type: none"> • Reaction paper • Quiz • One-minute paper • Situation based question • Application card etc. 	

Note : Any other assessment tools or methods can be adopted as per requirement of the course.

Foundation Course		
For the students admitted from A.Y. 2023-2024 & onwards		
Offering Department: Biochemistry	Offered to: B.Sc Biochemistry	
Semester – I		
Course Code	Course Title (F)	Course Credit and Hours
23UBCCC102	Basic Biochemistry Practical	2 Credits - 4 hrs/wk

Course Description:

This practical course provides hand on training to operate basic instruments used in biochemistry laboratory. Learner will develop problem solving ability, preparation of lab reagents. The course includes operation and application of pH meter to measure the pH of various chemicals and qualitative-quantitative determination of various biomolecules.

Course Purpose:

1. To establish an understanding of the quantitative aspects of biochemical analyses.
2. To establish the importance of chemical safety and precautions in the biochemical laboratory.
3. To develop basic practical biochemical skills for the handling and analysis of biomolecules.
4. To develop comparative, observational and operational skills required in the laboratory/industry

Course Outcomes: Upon completion of this course, the learner will be able to

CO No.	CO Statement	Blooms taxonomy Level (S ₁ to S ₆)
CO ₁	Acquaint with instruments used in biochemistry laboratory, basic laboratory practices and safety.	S ₁
CO ₂	Solve numerical problems and prepare various laboratory reagents	S ₃ , S ₄
CO ₃	Undertake experiments for qualitative identification of biomolecules	S ₁ , S ₃ , S ₄
CO ₄	Estimate concentration of unknown macro and micro molecules.	S ₁ , S ₄
CO ₅	Interpret and Analysis of results.	S ₃ S ₄

Suggested laboratory experiments:

1. Safety measures and introduction to the instruments used in biochemistry laboratory
2. Importance of calibration of instruments and cleaning of glasswares
3. Qualitative tests for carbohydrates.
4. Qualitative tests for lipids.
5. Estimation of reducing sugar by DNSA method.
6. Estimation of total sugar .
7. Quantitative estimation of Cholesterol
8. Estimation of Chlorophyll.
9. Estimation of Vitamin C: Titrimetric determination with DCPIP.

Pedagogic tools:

- Chalk and Board
- Laboratory Hands on training
- PowerPoint Presentation and Videos.
- Virtual Lab

Text books – Not applicable

Reference Books:

- Sadasivam, S. and Manickam, A. 2010. *Biochemical Methods*. [Third Edition]. New Age International (P) Ltd., New Delhi.
- Jayaraman, J. 2008. *Laboratory Manual in Biochemistry*. [First Edition Reprint]. New Age International (P) Ltd., New Delhi

Laboratory Manual/ Book

- Manual of Biochemistry Department, Shri M. & N. Virani Science College (Autonomous), Rajkot

Suggested reading / E-resources

- Not Applicable

Suggested MOOCs
<ul style="list-style-type: none"> • Not Applicable

Methods of assessing the Course Outcomes
The COs of the course will be assessed through
<ul style="list-style-type: none"> • CIA (Test, Performance, Record book, Viva Voce) • SEE

CIA Components	Marks
Test (After completion of 70-80% of accessible Practicals)	30
Performance and Record book	10
Grand Total	40

Sr. No.	SEE Component	Content	Duration (if any)	Marks	Sub Total
A	Test	After completion of course	6 hours	60	60
Grand Total					60