



बिरसा मुंडा ट्रायबल युनिवर्सिटी Birsā Mūṇḍā Tribal University

राजपिपला, जि. नर्मदा Rajpipla, Dist. Narmada

Established by Tribal Development Department, Govt. of Gujarat

School of Science B.Sc. (Zoology) Programme

Subject Code & Name: BS05MIZOO1 Biological Chemistry

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
2	-	2	4	25 %	25 %	25 %	25 %

Programme Name	B.Sc. Zoology
Semester	V
Course Code	BS05MIZOO1
Course Title	Biological Chemistry
Course Content Type (Th./Pr.)	Theory
Course Credit	4
Sessions + Lab. Per Week	2 + 2
Total Teaching/Lab. Hours	60 Hours
* 2 Laboratory = 1 Session	

Learning Objectives

- The course aims to build a structural and functional map of life at the molecular level.
- Students will explore how the three-dimensional shapes of carbohydrates, lipids, and proteins determine their roles in the body.
- To provide a fundamental understanding of the chemical basis of life, focusing on the structure, function, and metabolism of biomolecules.

Prerequisites (if any)

- Student requires a fundamental background in Organic Chemistry, specifically an understanding of functional groups and covalent bonding.
- Additionally, students should possess basic Cell Biology knowledge regarding organelles (cytoplasm and mitochondria) and a grasp of

Learning Outcomes

On the Completion of this course, students will able to:

- Students will identify biomolecules and explain their chemical properties and biological significance.
- They will calculate enzyme kinetics and understand metabolic pathways for energy production.
- Students will relate biochemical disorders and vitamin deficiencies to physiological conditions.





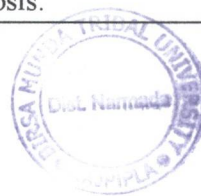
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Detailed Contents		
UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	Properties, classification, biological significance of Biomolecules Carbohydrates • Monosaccharides and their types. • Disaccharides: Maltose, Lactose, and Sucrose. • Polysaccharides: Starch, Glycogen, Cellulose, and Chitin. Lipids • Fatty acids: saturated, unsaturated, and essential fatty acids. • Phospholipids, glycolipids, cholesterol, and biological importance. Proteins and Amino Acids • Configuration of protein structure. • Amino acids: structure, classification, properties, and peptide bond. Enzymes • Enzyme kinetics: K_m and V_{max}. • Mechanism of enzyme action. Vitamins • Classification, sources, functions, and deficiency diseases of vitamins.	15
II	Biochemical Pathways (Metabolism) Bioenergetics: • Role of ATP as the universal energy currency; Exergonic and Endergonic reactions. Carbohydrate Metabolism: • Glycolysis (Embden-Meyerhof pathway): Aerobic and Anaerobic phases. • The Citric Acid Cycle (TCA/Krebs Cycle) and its energetic yield. • Glycogen Metabolism: Glycogenesis • Gluconeogenesis and Glycogenolysis (brief overview). Lipid Metabolism: • Beta-oxidation of saturated fatty acids (Palmitic acid). • Fatty Acid Synthesis: The cytoplasmic process of building long-chain fatty acids (brief overview). Protein Metabolism: • General reactions of amino acid metabolism • Urea Cycle. Oxidative Phosphorylation: • The Electron Transport Chain (ETC) and Chemiosmosis.	15





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Practicals

List of Practical (Practical are demonstrated using charts, models and multimedia videos)

1. Study the qualitative tests for carbohydrates (Glucose, Starch, Sucrose).
2. Prepare atomic models of monosaccharides by ball-stick.
3. Study the qualitative tests for proteins and amino acids.
4. Prepare atomic models of Amino acids by ball-stick.
5. Study the qualitative tests for lipids.
6. Prepare atomic models of Fatty acids by ball-stick.
7. Study the action of salivary amylase on starch.
8. Study the effect of temperature on enzyme activity.
9. Study the effect of pH on enzyme activity.
10. Study the models/charts of DNA and RNA.
11. Study the components of Electron Transport Chain and oxidative phosphorylation.
12. Study the biochemical pathways of glycolysis, Krebs cycle, beta-oxidation, and urea cycle.

Text Book(s)

1. Fundamentals of Biochemistry by J.L. Jain, Sunjay Jain, Nitin Jain – S. Chand
2. Biochemistry by U. Satyanarayana, U. Chakrapani, Elsevier
3. A Text Book of Biochemistry, S.N. Gupta, Rastogi Publications
4. Biochemistry and Physiology, Veer Bala Rastogi, Kedarnath Ramnath
5. Biochemistry, N. Arumugam, S. Prasanna Kumar, L.M. Narayanan, R.P. Meyyan, K. Nallasingam, Saras Publication
6. Biochemistry and Biotechniques, N. Arumugam, Saras Publication

Reference Books

1. Lehninger Principles of Biochemistry by David L. Nelson, Michael M. Cox, W.H. Freeman
2. Biochemistry by Jeremy M. Berg, John L. Tymoczko, Lubert Stryer, W.H. Freeman
3. Harper's Illustrated Biochemistry by Victor W. Rodwell et al., McGraw Hill
4. Biochemistry by Donald Voet, Judith G. Voet, Wiley Publishers
5. Textbook of Biochemistry for Medical Students by D.M. Vasudevan, Sreekumari S., Kannan Vaidyanathan, Jaypee Brothers Medical Publishers
6. Textbook of Medical Biochemistry by M.N. Chatterjee, Rana Shinde by Jaypee Brothers Medical Publishers
7. Biochemistry by Pankaja Naik, Jaypee Brothers Medical Publishers
8. Textbook of Biochemistry by Rafi M.D., Universities Press
9. Medical Biochemistry by Dinesh Puri, Elsevier
10. Encyclopedia of Biological Chemistry by William J. Lennarz, M. Daniel Lane, Academic Press





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Web Resources

Biochemistry Free for All (Oregon State University),
<https://www.um.edu.mt/library/oar/handle/123456789/47733>
LibreTexts Chemistry - Biological Chemistry, <https://chem.libretexts.org/>
MIT OpenCourseWare (OCW) – Biochemistry, <https://ocw.mit.edu/>
BACON (Biology And Chemistry Online Notes), <https://learnbacon.com>
QR Chem, <https://qrchem.net/>
ASBMB (American Society for Biochemistry and Molecular Biology), <https://www.asbmb.org/>

L:: Lecture, **T::** Tutorial , **P::** Practical

CCE:: Continuous and Comprehensive Evaluation

(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/ surprised), attendance etc. or any combination of these)

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation