

Lecture Plan		
Name of the College: Government College of Arts, Science and Commerce. Sanquelim - Goa		
Name of Faculty: Dr. Vaibhav Chindarkar	Subject: Zoology	
Paper code: ZOO-306 Biochemistry of Metabolic Processes	Program: T.Y. BSc	Division: A
Academic year: 2025- 2026	Semester: VI	Total Lectures: 45
<ul style="list-style-type: none">• Course Objectives:• Acquaint students about metabolic processes• 2. Provide students the basic knowledge of carbohydrate, protein and lipid metabolism.• 3. Understand the basic concepts of energy and its production.• 4. Perform basic experiments to estimate biomolecules in samples		
Expected Course Outcome: At the end of this course, students will be able to:		
CO1: Explain the fundamental concepts of metabolism and bioenergetics, including stages and regulation of metabolic pathways, principles of thermodynamics, and the role of ATP and other nucleotides as energy carriers in living systems.		
CO2: Describe and integrate the major pathways of carbohydrate metabolism, including glycolysis, pentose phosphate pathway, citric acid cycle, gluconeogenesis, glycogen metabolism, and their linkage with the mitochondrial respiratory chain and oxidative phosphorylation.		
CO3: Analyze amino acid and lipid metabolism with respect to transamination, deamination, urea cycle, fatty acid oxidation, ketogenesis, and regulatory controls, and relate metabolic abnormalities to selected inborn errors of metabolism.		

CO4: Evaluate the interrelationship and regulation of carbohydrate, lipid, and amino acid metabolism under different physiological and pathological conditions, emphasizing metabolic integration and energy homeostasis.							
Student Learning Outcome: The student will be able to understand general metabolism, anabolic and catabolic reactions and various metabolic pathways involved in Carbohydrate, Protein and Lipid metabolism and their regulation							
Month	Lecture From	Lecture To	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/ Assignment	ICT Tools	Reference books
December	01-12-2025	06-12-2025	03	Metabolism introduction		Power point presentation	Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
				Stages of catabolism,			
				Sub divisions of Metabolism			
December	08-12-2025	13-12-2025	03	Catabolism vs. Anabolism		Power point presentation	Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
				Catabolism vs Anabolism contd.....			
				regulation of Metabolic pathways			
December	15-12-2025	20-12-2025	03	Shuttle systems: Need for shuttle system, Malate Aspartate		Power point	Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
				Shuttle systems: Glycerol phosphate.			
				membrane transporters			
December	22-12-2025	24-12-2025	01	Antiport, symporters, uniport		Power point presentation	U. Sathyanarayan and U. Chakrapani, "Biochemistry," Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M.
				Bioenergetics: Concept and principles			

							(2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
January	02-01-2026	03-01-2026	01	Concept of Energy		Power point presentation Power point presentation Power point presentation Power point presentation	U. Sathyanarayan and U. Chakrapani, “Biochemistry,” Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
				Laws of Thermodynamics			
				Free energy, Free energy, thermodynamic quantities			
January	05-01-2025	10-01-2025	03	Standard Free energy, Nucleotides as energy carriers		Power point presentation Power point presentation Power point presentation Power point presentation	U. Sathyanarayan and U. Chakrapani, “Biochemistry,” Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
				ATP as “energy currency” of the cell			
				Sequence of Reactions and Regulation of Glycolysis			
January	12-01-2025	17-01-2025	03	Sequence of Reactions and Regulation of Glycolysis contd.....		Power point presentation	U. Sathyanarayan and U. Chakrapani, “Biochemistry,” Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
				Pentose phosphate pathway			
				Pentose phosphate pathway contd.....			
January	19-01-2026	24-01-2026	03	Oxidative decarboxylation		Power point presentation	U. Sathyanarayan and U. Chakrapani, “Biochemistry,” Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M. (2017).
				Citric acid cycle			

				Citric acid cycle			<i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
January	27-01-2026	31-01-2025	03	Gluconeogenesis		Power point presentation	U. Sathyanarayan and U. Chakrapani, "Biochemistry," Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
				Gluconeogenesis			
				Glycogenolysis			
February	02-02-2026	07-02-2026	03	Glycogenolysis contd,		Power point presentation	U. Sathyanarayan and U. Chakrapani, "Biochemistry," Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
				Glycogenesis			
				Mitochondrial respiratory Chain			
February	09-02-2026	14-02-2026	03	Mitochondrial respiratory Chain contd.....		Power point presentation	U. Sathyanarayan and U. Chakrapani, "Biochemistry," Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
				Theories of oxidative phosphorylation mechanisms.			
				Catabolism of amino acids			
February	16-02-2026	21-02-2026	03	Transamination		Power point presentation	U. Sathyanarayan and U. Chakrapani, "Biochemistry," Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M. (2017).
				Transamination contd....			

				Deamination			<i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
February	23-02-2026	28-02-2026	03	Urea Cycle		Power point presentation	U. Sathyanarayan and U. Chakrapani, "Biochemistry," Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
				Urea Cycle contd....			
				Fate of C-skeleton of Glucogenic and Ketogenic amino acids			
March	02-03-2026	07-03-2026	03	inborn errors of Amino acid catabolism		Power point presentation	U. Sathyanarayan and U. Chakrapani, "Biochemistry," Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
				inborn errors of Amino acid catabolism contd....			
				Beta-oxidation of fatty acids			
March	09-03-2026	14-03-2026	03	Palmitic acid {saturated (C 16:0) beta oxidation		Power point presentation	U. Sathyanarayan and U. Chakrapani, "Biochemistry," Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
				Palmitic acid {saturated (C 16:0) beta oxidation contd.....			
				Linoleic acid {unsaturated (C 18:2) beta oxidation			
March	16-03-2026	21-03-2026	02	Linoleic acid {unsaturated (C 18:2) beta oxidation contd....		Power point presentation	U. Sathyanarayan and U. Chakrapani, "Biochemistry," Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M. (2017).
				Alpha oxidation			
				Omega oxidation			

							<i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
March	23-03-2026	28-03-2026	02	ketogenesis- Ketogenic and Antiketogenic substances,		Power point presentation	U. Sathyanarayan and U. Chakrapani, “Biochemistry,” Books and Allied (P) Ltd., 3rd Edition, Kolkata, 2007, Nelson, D. L., & Cox, M. M. (2017). <i>Lehninger principles of biochemistry</i> (7th ed.). W.H. Freeman., online resources
				Ketogenic and Antiketogenic substances contd.....			
				Regulation of ketogenesis			

*** Assessment Rubrics**

Component	Max Marks
ISA 1	7.5
ISA 2	7.5
ISA 3	7.5
Practical	25
Semester End Exam	75