

SEMESTER -III
BSc. (Life Science) – Zoology Component

DISCIPLINE SPECIFIC CORE COURSE-9 (Zoo-LS-DSC-9):– Biochemistry: Basic concepts of

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		
Biochemistry: Basic concepts of metabolism Zoo-LS-DSC-09	04	02	00	02	Passed Class XII	NIL

Learning Objectives

The learning objectives of this course are as follows:

- to learn and develop an understanding of the various metabolic pathways in humans.
- to acquire knowledge of the tissue specific metabolism and its regulation.
- to get acquainted with the concept of enzyme specificity for important metabolic pathways and how the body adjusts to variations in the demand for energy.

Learning Outcomes

By studying this course, students will be able to:

- better understand the properties of carbohydrates, proteins, lipids, and their importance in biological systems.
- explain the biological mechanisms, such as the processes and control of bioenergetics and metabolism, as chemical reactions
- comprehend the concept of enzyme, its mechanism of action and regulation.
- appreciate the importance of high energy compounds, electron transport chain, synthesis of ATP under aerobic and anaerobic conditions.
- acquire knowledge related to the role of TCA cycle in central carbon metabolism, importance of anaplerotic reactions and redox balance.

SYLLABUS OF DSC- 09

UNIT-1: Metabolism of Carbohydrates

8 hrs

Basic structure and physiological significance of mono-saccharides, disaccharides, homo and hetero-polysaccharides. Glycolysis: Preparatory and Payoff phases, regulation, fates of pyruvate, Pentose phosphate pathway: oxidative and non-oxidative Phases; Gluconeogenesis: Bypass reactions, regulation and reciprocal coordination of glycolysis

and gluconeogenesis; Glycogen Metabolism: Glycogenolysis, Glycogenesis and its coordinated regulation, Krebs's Cycle (formation of Acetyl CoA, reactions of cycle, regulation),

UNIT- 2: Lipid Metabolism

6 hrs

Basic structure and physiological significance of fatty acids, structure and significance of storage and structural lipids; Biosynthesis: FAS and synthesis reactions, regulation; β oxidation of palmitic acid: activation of fatty acids and oxidation with bioenergetics, regulation.

UNIT- 3: Protein metabolism

6 hrs

Structure, classification and properties of amino acids, basics of protein structure; Transamination, Deamination, Glutamine formation, Glucose alanine cycle and Urea Cycle

UNIT- 4: Enzyme

6 hrs

Enzymes and their classification, Introduction (basics of classification, properties and functions), Mechanism of action (understanding of basic concepts, Induced Fit Theory).

UNIT- 5: Oxidative Phosphorylation

4 hrs

Review of Electron Transport Chain: Basics of electron transfer reactions, Universal Electron Acceptors without detailed structures, electron flow through complexes, Chemiosmotic theory, basics of ATP synthesis.

Practical

60 hrs

(Laboratory periods: 15 classes of 4 hours each)

1. Qualitative tests to identify functional groups of carbohydrates, amino acids and lipids.
2. Estimation of total protein in given solutions by Lowry's method.
3. Study effect of temperature, pH, and inhibitor on enzymatic activity of salivary amylase.
4. Biological oxidation of goat liver.
5. Identification of normal and abnormal constituents of urine.
6. To study the enzymatic activity of Lipase.
7. Dry Lab: To trace the labelled 'C' atoms of Acetyl-CoA till they evolve as CO₂ in the TCA cycle through models.

Essential/recommended readings

1. Nelson, D.L., Cox, M.M. (2017). Lehninger: Principles of Biochemistry (7th ed.). New York, WH: Freeman Company.
2. Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well,, P.A. (2009). Harper's Illustrated Biochemistry. XXVIII Edition, International Edition, The McGraw- Hill Companies Inc.

Suggestive readings

1. Stryer, L., Berg, J., Tymoczko, J., Gatto, G. (2019). Biochemistry (9 th ed.). New York, WH: Freeman.
2. Voet, D., Voet. J. G. (2013). Biochemistry (4th ed.). New Jersey, John Wiley & Sons Asia Pvt. Ltd.