

ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM  
VIII SEMESTER **BIOTECHNOLOGY** TIME: 3 Hrs/ Week  
BTH 8702(3) **ENZYMOLGY & INTERMEDIARY METABOLISM** Max. Marks: 100  
(Core course)

W.e.f 20AH Batch

**OBJECTIVES:** To enable the students to –

- Attain on different enzymes and their significance
- Acquire the concept on bioenergetics and biological oxidation
- Comprehend carbohydrate metabolism
- Get the concept on lipid metabolism
- Be insightful on amino acid and nucleic acid metabolism

**I. Learning outcomes:**

1. Will achieve knowledge on different enzymes and their significance
2. Learnt about bioenergetics and biological oxidation
3. Will comprehend carbohydrate metabolism
4. Can understand lipid metabolism
5. Will be thoughtful about amino acid and nucleic acid metabolism

**UNIT-I: Enzymology**

1. Introduction to Biocatalysis, differences between chemical and biological catalysis.
2. Nomenclature and classification of enzymes.
3. Definition of holo-enzyme, apo-enzyme, coenzyme, cofactor.
4. Active site, Enzyme specificity.
5. Principles of energy of activation, transition state.
6. Interaction between enzyme and substrate-lock and key, induced fit models.
7. Fundamentals of enzyme assay, enzyme units. Outlines of mechanism of enzyme action, factors affecting enzyme activity.
8. Commercial application of enzymes.

**UNIT – II: Bioenergetics and Biological oxidation**

1. Concept of free energy, enthalpy (H), entropy (S). Free energy change in biological transformations in living systems;
2. High energy compounds. Oxidation-reduction reactions.
3. Organization of electron carriers and enzymes in mitochondria.
4. Inhibitors and uncouplers of electron transport chain, oxidative phosphorylation.
5. Mechanism of oxidative phosphorylation.

**UNIT – III: Carbohydrate metabolism**

1. Concept of anabolism and catabolism.
2. Glycolytic pathway, energy yield. Fate of pyruvate - formation of lactate and ethanol,
3. Citric acid cycle, regulation, energy yield, amphipathic role. Anaplerotic reactions.
4. Glycogenolysis and glycogenesis. Pentose phosphate pathway. Gluconeogenesis.
5. Photosynthesis- Light and Dark reactions, Calvin cycle, C4 Pathway.

#### **UNIT – IV: Lipid metabolism**

1. Catabolism of fatty acids ( $\beta$ - oxidation) with even and odd number of carbon atoms, Ketogenesis,
2. DE NOVO synthesis of fatty acids, elongation of fatty acids in mitochondria and microsomes.
3. Biosynthesis and degradation of triacylglycerol and lecithin.
4. Biosynthesis of cholesterol.

#### **UNIT V: Amino acid and nucleic acid metabolism**

1. General reactions of amino acid metabolism- transamination, decarboxylation and deamination.
2. Urea cycle and regulation.
3. Catabolism of carbon skeleton of amino acids- glycolytic and ketogenic amino acids.
4. Purine and pyrimidine metabolism.

#### **REFERENCES**

1. Principles of Biochemistry by A.L.Lehninger, 2 Ed. (worth).
2. Lehninger Principles of Biochemistry by Nelson, D and Cox, D. Macmillon Pub.
3. Biochemistry by L.Stryer 5 Ed. (Freeman-Toppan).
4. Text Book of Biochemistry by West et. al., (Mac Millan).
5. Principles of Biochemistry by Smith et. al., (McGraw Hill).
6. Harper's Biochemistry (Langeman).
7. Biochemistry by D.Voet and J.G.Voet (John weily).
8. Enzymes by Palmer (East).

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