

**CHOICE BASED CREDIT SYSTEM**  
**SECOND YEAR B.Sc. BIOCHEMISTRY 2019-20**  
**THIRD SEMESTER**  
**Theory : BCT-301 Enzymology and Bioenergetics**

**Unit - I : Bioenergetics**

1. Energy transformations in the living system
2. Free energy, Enthalpy and Entropy concepts.
3. Exergonic and endergonic reactions.
4. High energy compounds.
5. Phosphate group transfer potential.
6. Substrate level phosphorylation.

**Unit – II: Biological Oxidations**

1. Redox reactions. Redox couplers. Reduction potential ,Standard reduction potential of some biochemically important half reactions.
2. Ultrastructure of mitochondria, Electron transport chain and carriers involved.
3. Oxidative phosphorylation, theories of oxidative phosphorylation- Mitchell's chemiosmotic theory.  $F_0F_1$ - ATPase, Inhibitors of respiratory chain and oxidative phosphorylation, uncouplers.
4. Ultrastructure of chloroplast
5. Cyclic and non-cyclic photophosphorylation.

**Unit - III : Introduction to 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, Fundamentals of enzyme assay, enzyme units.
4. Methods of Enzyme purification
5. Enzyme specificity. Active site.
6. Principles of energy of activation, transition state.
7. Interaction between enzyme and substrate- lock and key, induced fit models.

**Unit III: Influence of Physical factors and Inhibitors on Enzyme activity.**

**12 hours**

1. Factors affecting the catalysis- substrate concentration, pH, temperature, Time, Enzyme concentration and Product concentration
2. Michaelis - Menten equation for single substrate reaction, significance of  $K_M$  and  $V_{max}$ .
3. Enzyme inhibition- irreversible and reversible, types of reversible inhibitions- competitive and non-competitive.

**Unit – IV: Enzyme Kinetics and Enzyme action**

1. Rate of a Reaction Outline of mechanism of enzyme action- — acid-base catalysis, covalent catalysis, electrostatic catalysis, and metal ion catalysis
2. . Regulation of enzyme activity- allosterism and cooperativity, ATCase as an allosteric enzyme, covalent modulation- covalent phosphorylation of phosphorylase.
3. Zymogen activation- activation of trypsinogen and chymotrypsinogen. .
4. Isoenzymes (LDH) and Multienzyme complexes (PDH). Ribozyme.

## References:

1. Lehninger's Principles of Biochemistry – Nelson.D.L. and Cox.M.M., Freeman & Co.
2. Biochemistry – Berg.J.M., Tymoczko.J.L. and Stryer.L., Freeman & Co.
3. Biochemistry – Voet.D and Voet., J.G., John Wiley & Sons .
4. Textbook of Biochemistry – West.E.S., Todd.W.R., Mason.H.S..and. Bruggen, J.T.V., Oxford & IBH Publishers.
5. Outlines of Biochemistry – Conn.E.E., Stumpf.P.K., Bruening, G and Doi.R.H., John Wiley & Sons .
6. Harper's Illustrated Biochemistry – Murray, R.K., Granner.D.K. & Rodwell,V.W., McGraw-Hill
7. Biochemistry-Lippincott's Illustrated Reviews. Champe, P.C. and Harvey, R. A.Lippincott
8. Fundamentals of Biochemistry –Jain, J.L., Jain, S., Jain, N. S. Chand & Co.
9. Biochemistry – Satyanarayana. U and Chakrapani. U, Books & Allied Pvt. Ltd.
10. Fundamentals of Enzymology – Price.N.C. and Stevens.L., Oxford University Press.
11. Understanding Enzymes – Palmer.T., Ellis Harwood.
12. Enzymes – Biochemistry, Biotechnology, Clinical Chemistry – Palmer.T., Affiliated East-West Press