

## Core VII

## Fundamentals of Biochemistry

### Programme Outcome:

- To gain understanding of fundamentals of biochemistry and biological macromolecules.
- To understand structure, classification, properties and significance of biomolecules.
- Acquire knowledge on nomenclature, classification and mechanism of enzyme action, regulation and its kinetics.

### Course Outcome:

- To understand the structure and biological importance of protein, carbohydrates, lipids, nucleic acids and enzymes.
- Providing knowledge on types of amino acids and its polymeric form.
- Learning the structure and pairing of nucleotides, denaturation and denaturation kinetics of DNA.
- Obtaining knowledge on enzymes and isoenzymes, specificity, inhibition, derivation of Michaelis-Menten equation.

### Learning Outcome:

- Gaining knowledge on different classes of biological macromolecules such as carbohydrates, lipids and nucleic acids.
- Understanding the structure of proteins and its monomers.
- Learning the structure of nucleic acids, denaturation and renaturation kinetics of DNA.
- Interpret the activities of enzymes and isoenzymes.

### Unit 1: Carbohydrates & Lipids

Structure and Biological importance: Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates; Structure and Significance: Physiologically important saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Glycolipids, Steroids.

### Unit 2: Proteins

Amino acids: Structure, Classification and General properties of  $\alpha$ -amino acids; Physiological importance of essential and non-essential  $\alpha$ -amino acids.

Proteins: Bonds stabilizing protein structure; Levels of organization in proteins; Renaturation, Denaturation; Introduction to simple and conjugate proteins

Immunoglobulins: Basic Structure, Classes and Function, Antigenic Determinants.

### Unit 3: Nucleic Acids

Structure: Purines and pyrimidines, Nucleosides, Nucleotides, Nucleic acids. Cot Curves, Base pairing, Denaturation and Renaturation of DNA, Types of DNA and RNA, Complementarity of DNA, Hypo and Hyperchromaticity of DNA.

## Unit 4: Enzymes

Nomenclature and classification, Cofactors, Specificity of enzyme action, Isozymes, Mechanism of enzyme action, Enzyme kinetics, Factors affecting rate of enzyme-catalyzed reactions, Derivation of Michaelis-Menten equation, Concept of  $K_m$  and  $V_{max}$ , Lineweaver-Burk plot, Multi-substrate reactions, Enzyme inhibition, Allosteric enzymes and their kinetics, Regulation of enzyme action.

### Text Books:

- ✓ *Satyanarayan and Chakrapani, (2017) Biochemistry, Elsevier; Fifth edition*
- ✓ *Cox, M.M and Nelson, D.L. (2008). Lehninger's Principles of Biochemistry, V Edition, W.H. Freeman and Co., New York.*
- ✓ *Jeremy M. Berg, Lubert Stryer, John L. Tymoczko, Gregory J. Gatto, Biochemistry, 8<sup>th</sup> edition, 2015.*
- ✓ *Victor W., Rodwell, David A., Bender, Kathleen M., Botham, Peter J., Kennelly, P. Anthony, Harper's Illustrated Biochemistry, 31<sup>st</sup> edition.*

### Suggested Readings:

- ✓ *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.*
- ✓ *Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R. (2008). Molecular Biology of the Gene, VI Edition, Cold Spring Harbor Lab. Press, Pearson Publication.*
- ✓ *Hames, B.D. and Hooper, N.M. (2000). Instant Notes in Biochemistry, II Edition, BIOS Scientific Publishers Ltd., U.K.*
- ✓ *Devasena T. (2010). Enzymology Oxford University Press; 1 edition*
- ✓ *Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). Biochemistry, VI Edition, W.H. Freeman and Co., New York.*

## Fundamentals of Biochemistry

### Practical:

1. Qualitative tests of functional groups in carbohydrates, proteins and lipids.
2. Paper chromatography of amino acids.
3. Action of salivary amylase under optimum conditions.
4. Effect of pH, temperature and inhibitors on the action of salivary amylase/Urease/acid oralkaline phosphatase
5. Demonstration of proteins separation by SDS-PAGE.