Subject Code : P8ZO6

CORE COURSE VI - BIOCHEMISTRY AND BIOPHYSICS
A. BIOCHEMISTRY

Unit-I

Introduction to Biochemistry:

Scope of biochemistry – Physical and chemical processes of living systems – Water and it functions – Dissolved gases and their properties – pH and buffer.

Amino Acids

Structure and classification – Ketogenic and glucogenic amino acids – Catabolism of Tyrosine and Tryptophan.

Proteins

Classification – Globular and fibrous proteins – Structure and functions.

Enzymes

Classification – Properties – 3D structure of an enzyme – Enzyme kinetics – Mechanism of action of enzymes – Active sites – Coenzymes – Activators and inhibitors – Isoenzymes – Allosteric enzymes – Regulation of enzymatic activity.

Unit-II

Carbohydrates

Mono, oligo and polysaccharides – Structure, properties and functions.

Lipids

Classification, structure, properties and functions.

Prostaglandins – their classes, functions and Pharmacological uses.

Vitamins

Structure of water soluble and fat soluble vitamins.

Unit-III

Respiratory pigments

Structure of Hemoglobin and Cytochrome

Biological Oxidation

Nucleotides, Flavoproteins, Cytochromes – Redox potential – Oxidative phosphorylation.

Energy relation, energy rich compounds, their roles.

Hypothalamic and hypophyseal factors – Chemistry and function – Mechanism of hormone action – Peptide hormone – Adenylate cyclase – Cyclic AMP mechanism – Ca^{++} - Phosphoinositol, steroid hormone and transcriptional control.

B. BIOPHYSICS

Unit-IV

Scope of Biophysics in Biology – structure and properties of atoms and molecules – Formation of molecules form atoms – Bonds – types – properties – strength – atomic and molecular orbitals – X-ray diffraction – Polymerization of organic molecules.

Energy sources – Principle and application of thermodynamic laws – Free energy from electromagnetic waves.

Natural radiations – Properties of natural light. Photoelectric effect – Photodynamic sensitization – LASER – Concept of spectroscopy. Visible, NMR and ESR spectroscopy ;Atomic absorption and plasma emission spectroscopy.

Effect of UV light and ionizing radiations – Detection – Disintegration – Measurement of radio activity – Gieger Muller counter – Isotopes as tracers.

Unit-V

Microscopy – principles of optics in light, phase contrast, polarizing, fluoresence, scanning and transmission electron microscopes.

Principles of Centrifuge – sedimentation velocity – sedimentation equilibrium and density gradient centrifugation.

Principles and application of chromatography – Paper – Thin layer – Column – Ion – exchange – Gel filtration – Gas liquid – HPLC and Affinity.

Principles and applications of electrophoresis – Paper electrophoresis – Ager gel electrophoresis – PAGE – SDS-PAGE – Immunoelectrophoresis – Isoelectric focussing.

Recommended Text Books

BIOCHEMISTRY

1. LEHNINGER L. ALBERT, DAVID. L. NELSON, MICHAEL M. COX. (1993), Principles of Biochemistry, CBS Publishers and Distributors, Delhi.
2. STRYER, L. (1988), Biochemistry, W.H. Freeman and Company, New York.
3. COOPER, T.G. (1977), The Tools of Biochemistry, Wiley Interscience Publication, John Wiley and Sons, New York.

BIOPHYSICS

1. CASEY, E.J. (1962), Biophysics – Concepts and Mechanisms, East West Press Pvt. Ltd., New Delhi.

References

BIOCHEMISTRY

1. ROBERT K. MURAY, DARYL K. GRANNER, PETER A. NAYES, VICTOR W.RODWELL (1993), Harper's Biochemistry (24th Edition), Prentice Hall International Inc., London.
2. SMITH et al., (1985), Principles of Biochemistry, McGraw Hill (Mammalian Biochemistry).
3. VOET, D. and VOET, J. (1995), Biochemistry, John Wiley and Sons, New York.

BIOPHYSICS

1. DANIEL, M. (1989), Basic Biophysics for Biologists, Agro-Botanical Publishers, Bikaner, India.
2. De ROBERTIS, E.D.P. and De ROBERTIS E.M.F. (1987), Cell and Molecular Biology, VIII Edition, Lea and Febiger, Philadelphia.
3. DOG, A., DOUGLAS and JAMES J. LEARY (1992), Principles of Instrumental Analysis, Under Golden Sunberst Series.