

MOLECULAR BIOPHYSICS.

UNIT – I : CELLULAR BASIS OF LIFE

Structure and constituents of animal cell -plant cell and bacterial cell – its organelles – Molecular constituents of cell (elementary ideas) – Structures of viruses – types.

Stereo Chemistry and Conformation – Asymmetric carbon – Isomerism – Types – Constitution – Configuration and Conformation – Chirality – Fisher convention – L and D system – R-S System – Torsion angle – newman projection conformation of ethane and n-butane – Barrier to rotation.

UNIT – II : STRUCTURE AND CONFORMATION OF PROTEINS

Amino acids – Structure of Peptide bond – Rigid planar peptide bond – Rigid planar peptide – Cis and Trans configuration – Torsion angles Phi and Psi – Steric hindrance – hardsphere – approximation – contact criteria – Ramachandran (diagram) map – Allowed conformations for a pair of linked peptide units – (map for glycine and alanine residues) – classification of proteins – based on functions – based on structure – globular – fibrous – Levels of structural organization – Types of secondary structure – Helix - sheet – turns - super secondary and domain.

UNIT – III : STRUCTURE AND FUNCTION OF CARBOHYDRATE

Classification – Simple Mono Saccharides – Glyceraldehyde – Fisher projection formulae –L and D and R and S notation – other monosaccharides – Pyranose form – Stereo isomerism of sugars – conformation of pyranoid rings – Disaccharides structure of Cellobiose Maltose – Lactose – Sucrose – Types of linkages in polysaccharides – Ramachandran map for Disaccharides – Polysaccharides – Classification – Structural Storage – Function of cellulose – Amylose – Chitin – Glycogen – Complex carbohydrate – Functions of glycoproteins – proteoglycans – structure of peptidoglycan – Lectins.

UNIT – IV : STRUCTURE AND FUNCTION OF NUCLEIC ACIDS

Nucleosides and nucleotides – structure of oligonucleotides – base pairing and base stacking – Structure of DNA – Watson and Cricket model – Variations in DNA structure – Polymorphism – A, B and Z DNA – structure of RNA and tRNA – Genetic code – Protein – Protein biosynthesis – Reverse transcription – Basis ideas of Genetic engineering.

UNIT – V – ENZYMES, VITAMINS, HORMONES AND LIPIDS.

Enzymes – classification – Mechanism of enzyme action – Factors influencing enzyme action – enzymes of clinical interest – (Amylase, Lipase, Trypsin – Lysozyme).

Lipids: Classification of Fatty acids – Properties – complex lipids – Triglycerides
Phospholipids – Sphingolipids – Simple lipids – Terpenes.

Vitamins: Classification – Fat soluble vitamins – Vitamins A,D,E. and K –
Structure – Properties – functions – Water soluble Vitamins – Vitamin B
Complex thiamine (B1), Riboflavin (B2) – Niacin – Biotin – Folic acid – Vitamin
C – their functions.

Hormones: Properties – their chemistry and metabolic effects – Thyroxine –
Parathyroid hormone – Insulin and Glucagon – Sex hormones – Pituitary
hormones.

Elementary Programs for : (Fortran).

Internal Parameters – Bond Length – bond angle – torsion angle – calculation –
Fortran programs – coordinate generation – Fractional to orthogonal –
Given and U generation of coordinates – GNR MAP for dipeptide –
disaccharide – helical parameters – helix generation – Energy calculation –
Energy map for Ethane – dipeptide – disaccharide – Random coil – end to end
distance.

Books for Study and Reference:

A.L.Lehninger, D.L.Nelson and M.M.Cox, Principles of Biochemistry, CBS
Publishers, New Delhi. (1993).

L.Stryer, Biochemistry, W.H.Freeman and Co., New York (1997).

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Carbohydrates Harwood Academic Publishers, (1998).

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C.Branden and J.Tooze, Introduction to Protein Structure, Garland Publishing,
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J.F.Stoddart, Stereo Chemistry of Carbohydrates, Wiley Interscience (1971).

N.Sharon, Complex Carbohydrates – their Chemistry, Biosynthesis and
Functions – Addison – Wesley – London (1975).

J.K. Kennedy and C.A.White, Bio active carbohydrates in Chemistry
Biochemistry and Biology – Ellis Harwood, New York (1983).

W.Hoppe, et al., Biophysics – Springer Verlag (1989).

M.M.Woolfson – An Introduction to X-ray Crystallography, Cambridge
University Press, U.K., (1980).

Thomas E.Creighton, Proteins structure and molecular properties, W.H.freeman
and Company, New York (1993).