OC S 514: BIOORGANIC CHEMISTRY

Course Outcome

Students will be able to:

- Understand the configuration and conformation of monosaccharides, chemistry of important derivatives of monosaccharides, structure and synthesis of disaccharides, general methods of determination of polysaccharide structures, structure and industrial applications of polysaccharides.
- Learn, structure, classification, properties and synthesis of amino acids.
- Explain the peptide bond formation, synthetic protocol for peptides, solution and solid phase peptide synthesis, Methods of peptide structure determination, different types protein structures and their biological importances.
- Nucleosides, nucleotides, synthesis of nucleosides, nucleotides and polynucleotides, structure and functions of nucleic acids.

UNIT-I **[12 Hours]**

Carbohydrates: Introduction and classification, Monosaccharides-Introduction, general reactions (isomerization, glycoside formation, hydrazones and osazones, alditols by reduction, oxidation-aldonic, uronic, aldaric acidsand oxidative cleavage), ring size determination of monosaccharides, configuration and conformations of monosacharides, anomeric effect, Hudson's rules, epimerization and mutarotation. Synthesis and biological importance of glycosides-ethers and esters, anhydrosugars. Deoxy and amino sugars. Dissaccharides-Structure, synthesis and biological aspects of sucrose, maltose and lactose. Industrial applications of sucrose. Polysaccharides-General methods of structure elucidation, Structure and biological functions of starch and cellulose. Industrial and biological importance of glycogen, dextran, hemicellulose, pectin, agar-agar.

UNIT-II Amino acids, peptides and proteins **[12 Hours]**

Amino acids: General structure & classification of amino acids, Abbreviation of amino acids, physiological properties, essential and non-essential amino acids, isoelectric points, Acid and base properties, Methods of synthesis-Gabriel phthalimide, azalactone and Strecker synthesis. **Peptides:** Classification and nomenclature, Peptide bond -Structure and conformation, Strategy of peptide synthesis: protection (protection of amino group-Boc, Z(Cbz) and Fmoc; carboxyl group (alkyl and aryl esters) and side chain functional groups), activation and coupling (DCC, EDC, T_3P, HATU and active esters) and deprotection. Solution phase and Merrifield's solid phase synthesis, Racemization and use of HOBt. Structure and synthesis of oxytocin, Synthesis of vasopressin. Biological importance of insulin, adrenocorticotropic hormone (ACTH), Growth hormone (GH) and Thyroid stimulating hormone (TSH).

Proteins: Amino acid residue analysis, C- and N-terminal determination, cleavage of peptide bond by chemical and enzymatic methods, Primary structure (amino acid sequencing), secondary structure (α- helix, β-sheets and super secondary structure) of proteins-forces responsible for holding of secondary structures, Tertiary structure of protein (folding and domain structure) and quaternary structure. Denaturation and renaturation of proteins. Biological importance of proteins.

UNIT-III **[12 Hours]**

Nucleic acids: Introduction, components of nucleic acids-Chemical and enzymatic hydrolysis of nucleic acids, Structure, nomenclature and synthesis of purine and pyrimidine bases, Nucleosides

and nucleotides, Structures and functions of NADH, NADP and ATP, Protecting groups for hydroxy group in sugar, Amino group in the base and phosphate functions. Methods of formation of internucleotide bonds-DCC, phosphodiester approach, phosphitetriester and phosphoramide methods. Solution and solid phase synthesis of oligonucleotides. Primary, secondary and tertiary structure of DNA, base-pairing, types of RNA and their structures, role of nucleic acids in the biosynthesis of proteins (Replication, Transcription, Translation), Genetic code and Finger printing.

References

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