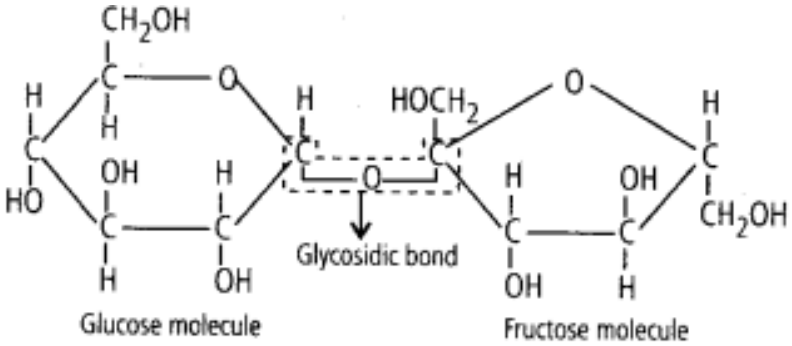
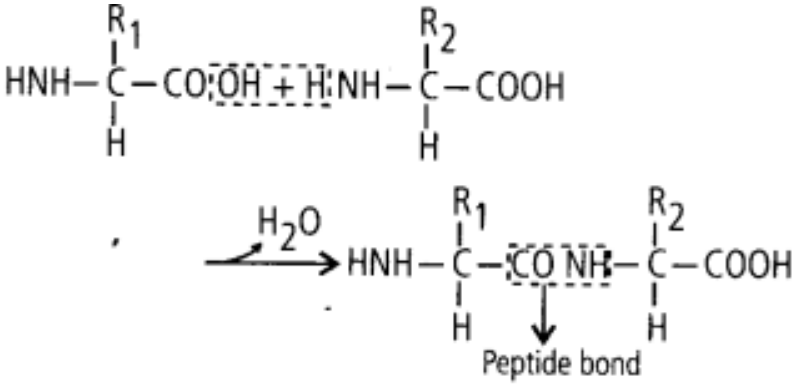
1. What are macromolecules ? Give examples.
Solution: Macromolecules are large high molecular weight substances with complex molecular structure and occur in colloidal state (being insoluble) in intracellular fluid. These are formed by polymerisation of large number of micromolecules.
Polysaccharides, proteins and nucleic acids are few examples.

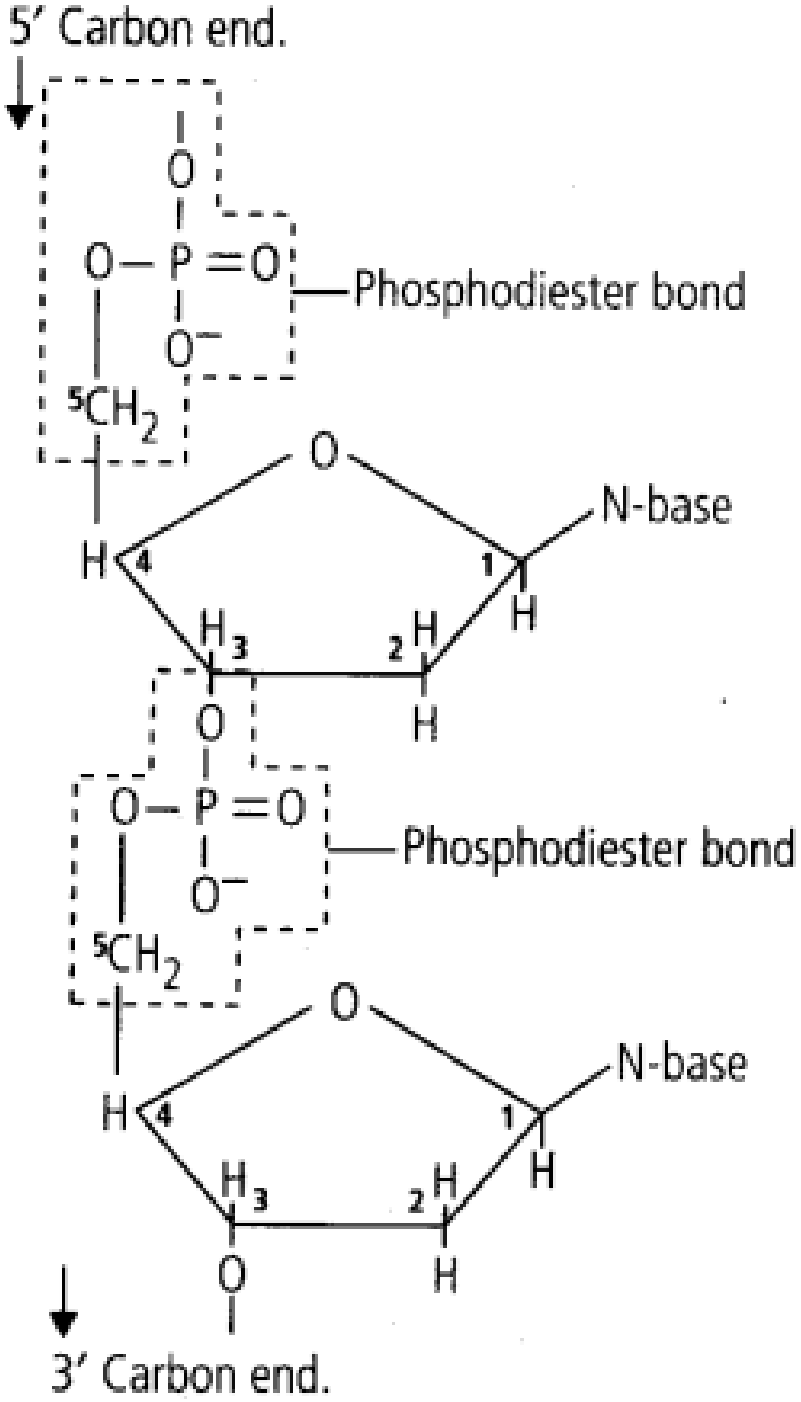
2. Illustrate a glycosidic, peptide, and a phospho- diester bond.
Solution:
(i) Glycosidic bond is the type of chemical linkage between the monosaccharide units of disaccharides, oligosaccharides and polysaccharides, which is formed by the removal of a molecule of water.



(ii) Peptide bonds are formed by the reaction between carboxyl (- COOH) of one amino acid and amino (- NH_2) group of other amino acid with the elimination of water.



(iii) In a polynucleotide chain, adjacent nucleotides are joined together by a bond called phosphodiester bond. This bond links a phosphate group and sugar group of two adjacent nucleotides by means of an oxygen bridge.

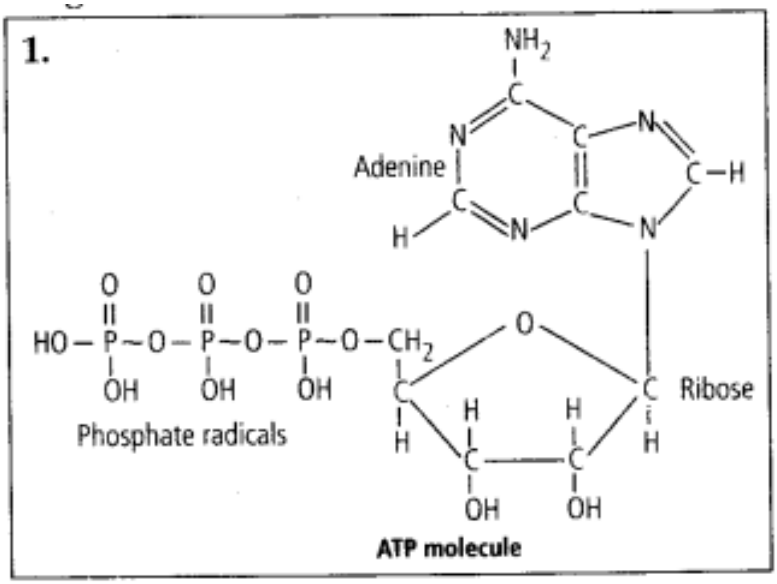


3. What is meant by tertiary structure of proteins?
Solution: The helical polypeptide molecule may fold on itself and assume a complex but specific form-spherical, rod-like or any form in between these. These geometrical shapes,are known as tertiary (3°) structure of protein molecules. The coils and folds of the polypeptide molecules are so arranged as to hide the non-polar amino acid chains inside and to expose the polar side chains. The tertiary structure of a protein brings distant amino acid side chains nearer to form active sites of enzymatic proteins. The tertiary structure is maintained by weak bonds such as hydrogen, ionic, disulphide and hydrophilic - hydrophobic bonds, formed between one part of a polypeptide and another. This structure is easily disrupted by pH, temperature and chemicals stopping the function of proteins.

4. Find and write down structures ©f 10 interesting small molecular weight biomolecules.
Solution: Interesfing small molecular weight biomolecules are minerals (like sodium, potassium, calcium, zinc, iodine etc), gases (like O_2, N_2, CO_2, NH_3) sugars - (ribose, deoxyribose, glucose,

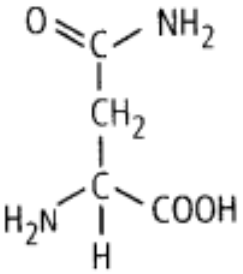
fructose), lipids, amino acids, nucleotides (pyrimidines & purine). Structures of 10 interesting small molecular weight biomolecules are as follows:

1.



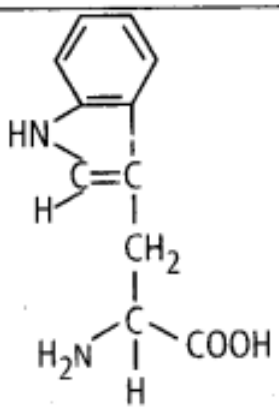
ATP molecule

2.



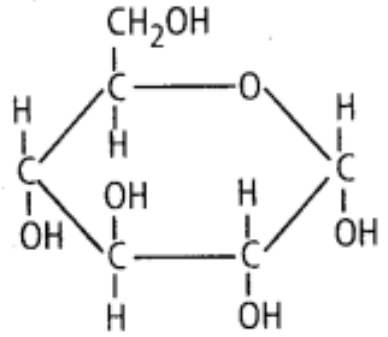
Asparagine (Asn)

3.



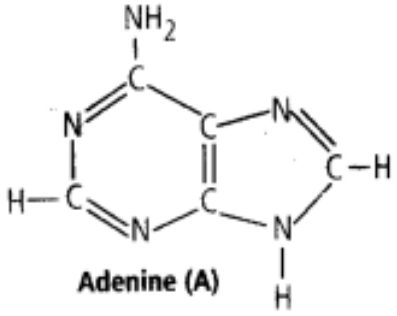
Tryptophan (Trp)

4.



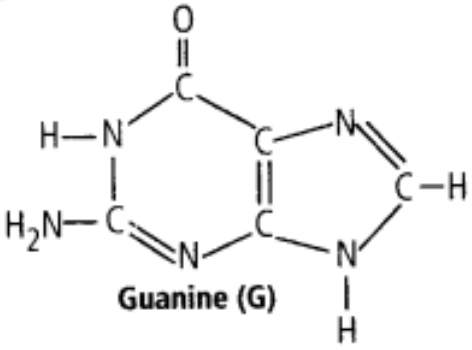
Glucose

5.



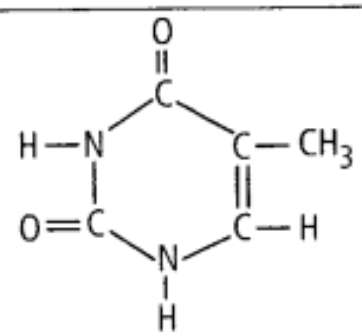
Adenine (A)

6.



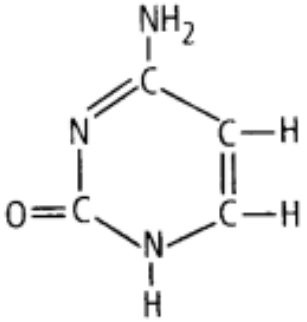
Guanine (G)

7.



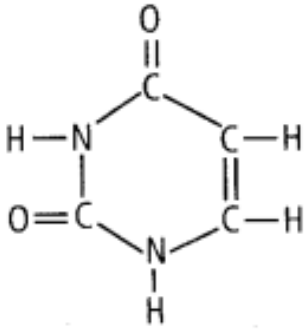
Thymine (T)

8.



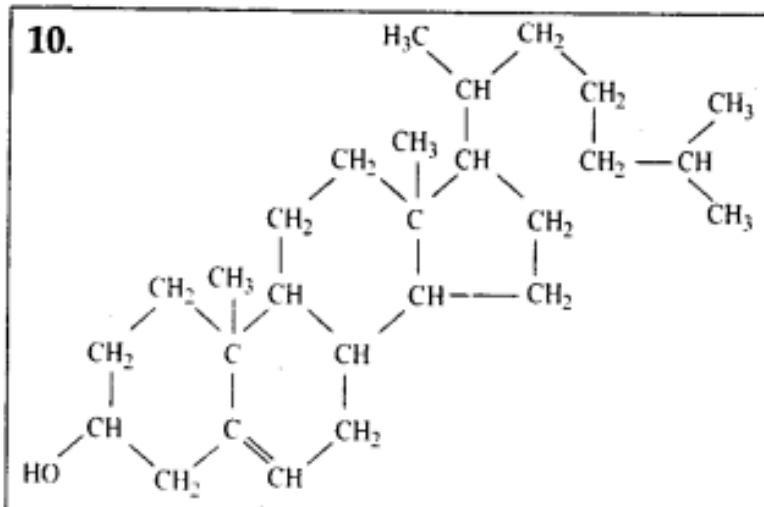
Cytosine (C)

9.



Uracil (U)

10.



Cholesterol

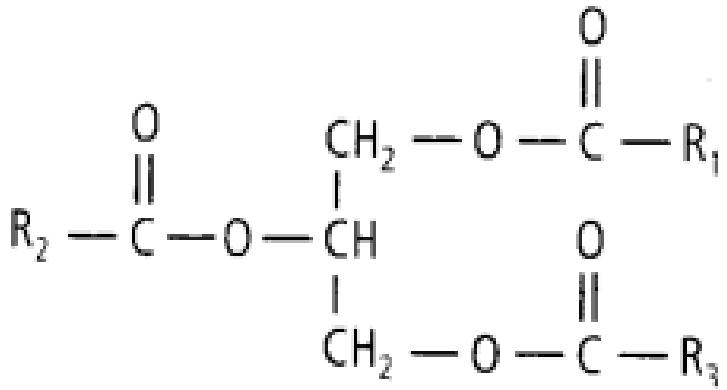
5. Proteins have primary structure. If you are given a method to know which amino acid is at either of two termini (ends) of a protein, can you connect this information to purity or homogeneity of a protein?

Solution: There are several methods provided by several scientists to find out the sequence of amino acids. Frederick Sanger proposed Sanger's reagent to know the amino acid sequence in a polypeptide

chain.
Sanger used 1-fluoro 2, 4 dinitrobenzene (FD NB) to determine insulin structure. FDNB specifically binds with N-terminal amino acid to form a dinitrophenyl (DNP) derivative of peptide. This DNP-derivative peptide can be identified by chromatography. The identified sequence of amino acids shows the homogeneity of a protein molecule.

6. Find out and make a list of proteins used as therapeutic agents. Find other applications of proteins.
Solution: Proteins used as therapeutic agents are: thrombin, fibrinogen, enkephalins, antigens, antibodies, streptokinase, protein tyrosine kinase, diastase, renin, insulin, oxytocin, vasopressin etc. Proteins are also used in cosmetics, dairy industries, textile industries, research techniques, biological buffers etc.

7. Explain the composition of triglycerides. Triacylglycerols (triglycerides) are the esters of glycerol with fatty acids.
Solution: They are insoluble in water and non-polar in character and commonly known as neutral fats. The neutral or depot fats are composed of carbon, hydrogen and oxygen like carbohydrates but have far fewer oxygen atoms than carbon atoms unlike the carbohydrates.



Triglyceride (R_1, R_2 and R_3 are fatty acids)

(i) Glycerol - A glycerol molecule has 3 carbons, each bearing a hydroxyl (-OH) group.
(ii) Fatty acids - A fatty acid molecule is an unbranched chain of carbon atoms with each carbon atom (C) forming four bonds to other atoms. It has a carboxyl group- COOH at one end and hydrogen atom (H) bonded to all or most carbon atoms forming a hydrogen chain. The carbon- hydrogen bonds are non-polar. Therefore, the hydrocarbon chain does not dissolve in water. Because the carboxyl group contains the polar C = O and OFI groups. It tends to dissolve in water even though the rest of fatty acid molecule will not. Triacylglycerols of plants, in general, have higher content of unsaturated fatty acids as compared to that of animals.

********** END **********