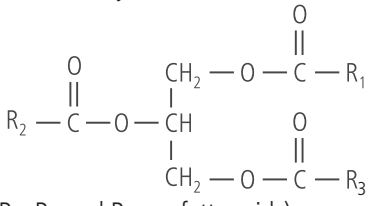
Biomolecules

NCERT FOCUS

ANSWERS

Topic 1

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



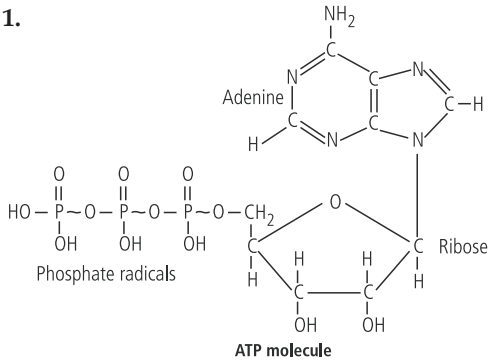
Triglyceride (R_1, R_2 and R_3 are fatty acids)

(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 OH 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.

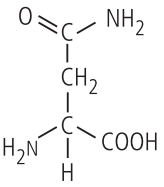
2. Interesting small molecular weight biomolecules are minerals (like sodium, potassium, calcium, zinc, iodine etc), gases (like O_2, N_2, CO_2, NH_3) sugars - (ribose, deoxyribose, glucose, fructose), lipids, amino acids, nucleotides (pyrimidines & purine). Structures of 10 interesting small molecular weight biomolecules are as follows:

1.



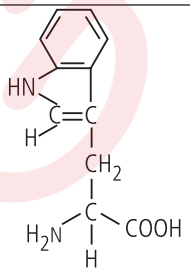
ATP molecule

2.



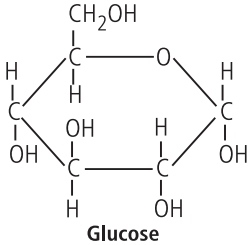
Asparagine (Asn)

3.



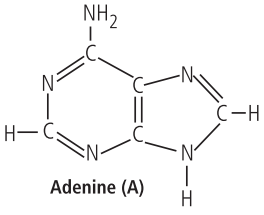
Tryptophan (Trp)

4.



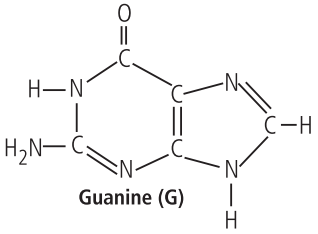
Glucose

5.



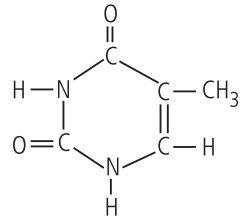
Adenine (A)

6.



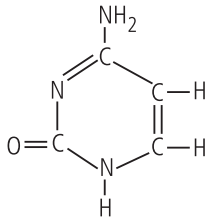
Guanine (G)

7.



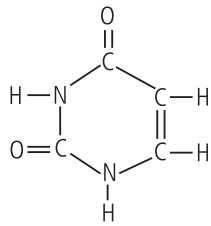
Thymine (T)

8.



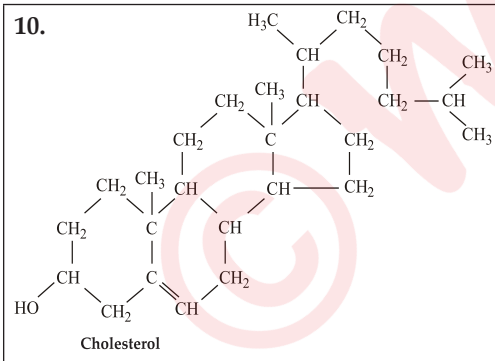
Cytosine (C)

9.



Uracil (U)

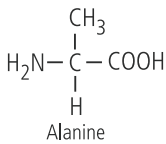
10.



Cholesterol

3. The existence of different ionic forms of amino acids can be easily understood by the titration curves. The number of dissociating functional group is one in case of neutral and basic amino acids and two in case of acidic amino acids.

4.



Alanine

Topic 2

1. 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 bonds such as hydrogen, ionic, disulphide and hydrophilic - hydrophobic bonds, formed between one part of a polypeptide and another.

2. 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 (FDNB) 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.

3. Proteins used as therapeutic agents are: thrombin, fibrinogen, 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.

4. Milk is converted into curd or yoghurt due to denaturation of proteins. In denaturation, disruption of bonds that maintains secondary and tertiary structure leads to the conversion of globular proteins into fibrous proteins. This involves a change in physical, chemical and biological properties of protein molecules.

Topic 3

1. The important properties of enzymes are as follows:

(i) The enzymes are generally proteins which are high molecular weight complex globular proteins. They can associate with non-protein substance for their activity.

(ii) The enzymes do not start a chemical reaction but only accelerate it. They combine temporarily with the substrate molecules and are not consumed or changed permanently in the reaction which they catalyse.

(iii) The enzyme controlled reactions are reversible.

(iv) The enzymes are specific in action. An enzyme catalyses only a particular kind of reaction or acts on a particular substrate only.

(v) The enzymes are thermolabile *i.e.*, heat sensitive and can function best at an optimum temperature. Similarly, enzymes show maximum activity at optimum pH.

(vi) The enzymes are inactivated by poisons and radiation.

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