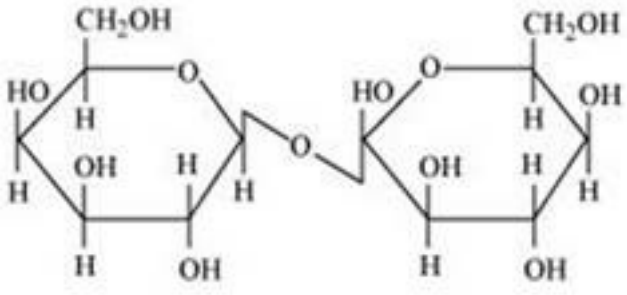
CBSE Class 12 physics
Important Questions
Chapter 14
Biomolecules

3 Mark Questions

1.What are the expected products of hydrolysis of lactose?

Ans. Lactose is composed of β-D-galactose and β-D-glucose. Thus, on hydrolysis, it gives β-D-galactose and β-D-glucose.

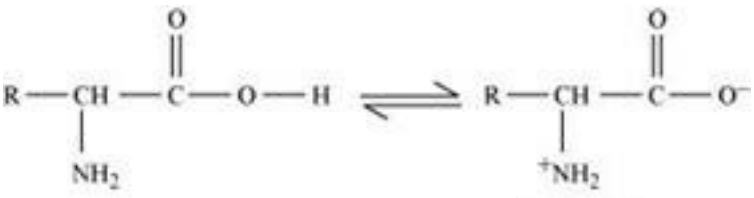


Lactose

$$\underset{\text{Lactose}}{C_{12}H_{22}O_{11}} + H_2O \rightarrow \underset{\text{D-(+)-Glucose}}{C_6H_{12}O_6} + \underset{\text{D-(+)-Galactose}}{C_6H_{12}O_6}$$

2.The melting points and solubility in water of amino acids are generally higher than that of the corresponding halo acids. Explain.

Ans. Both acidic (carboxyl) as well as basic (amino) groups are present in the same molecule of amino acids. In aqueous solutions, the carboxyl group can lose a proton and the amino group can accept a proton, thus giving rise to a dipolar ion known as a zwitter ion.



(Zwitter ion)

Due to this dipolar behaviour, they have strong electrostatic interactions within them and with water. But halo-acids do not exhibit such dipolar behaviour.

For this reason, the melting points and the solubility of amino acids in water is higher than those of the corresponding halo-acids.

3. When RNA is hydrolysed, there is no relationship among the quantities of different bases obtained. What does this fact suggest about the structure of RNA?

Ans. A DNA molecule is double-stranded in which the pairing of bases occurs. Adenine always pairs with thymine, while cytosine always pairs with guanine. Therefore, on hydrolysis of DNA, the quantity of adenine produced is equal to that of thymine and similarly, the quantity of cytosine is equal to that of guanine.

But when RNA is hydrolyzed, there is no relationship among the quantities of the different bases obtained. Hence, RNA is single-stranded.

4. What are monosaccharides?

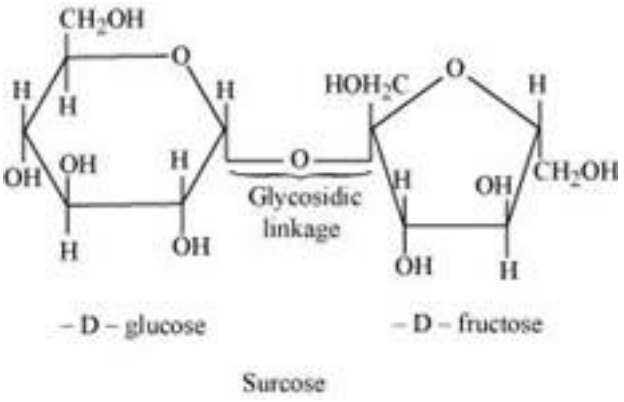
Ans. Monosaccharides are carbohydrates that cannot be hydrolysed further to give simpler units of polyhydroxy aldehyde or ketone.

Monosaccharides are classified on the bases of number of carbon atoms and the functional group present in them. Monosaccharides containing an aldehyde group are known as aldoses and those containing a keto group are known as ketoses. Monosaccharides are further classified as trioses, tetroses, pentoses, hexoses, and heptoses according to the number of carbon atomsthey contain. For example, a ketose containing 3 carbon atoms is called ketotriose and an aldose containing 3 carbon atoms is called aldotriose.

5. What do you understand by the term glycosidic linkage?

Ans. Glycosidic linkage refers to the linkage formed between two monosaccharide units through an oxygen atom by the loss of a water molecule.

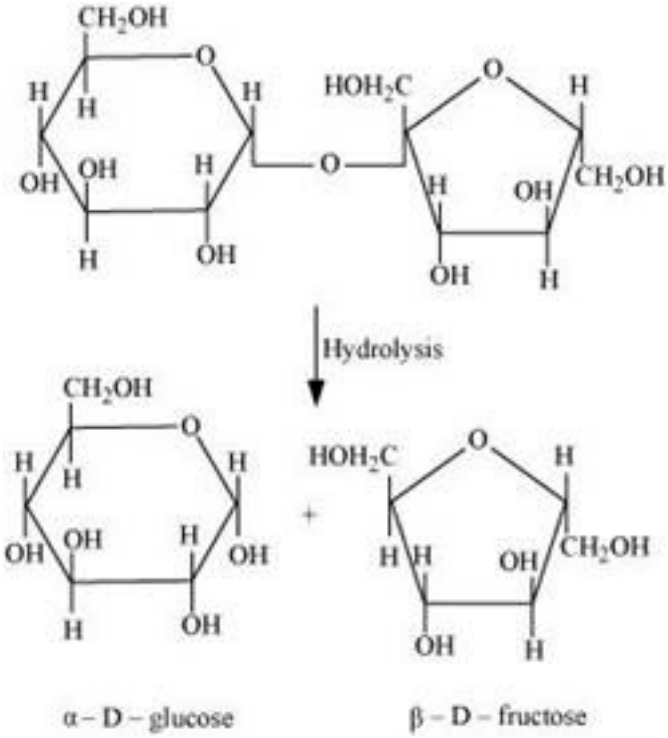
For example, in a sucrose molecule, two monosaccharide units, α-glucose and β-fructose, are joined together by a glycosidic linkage.



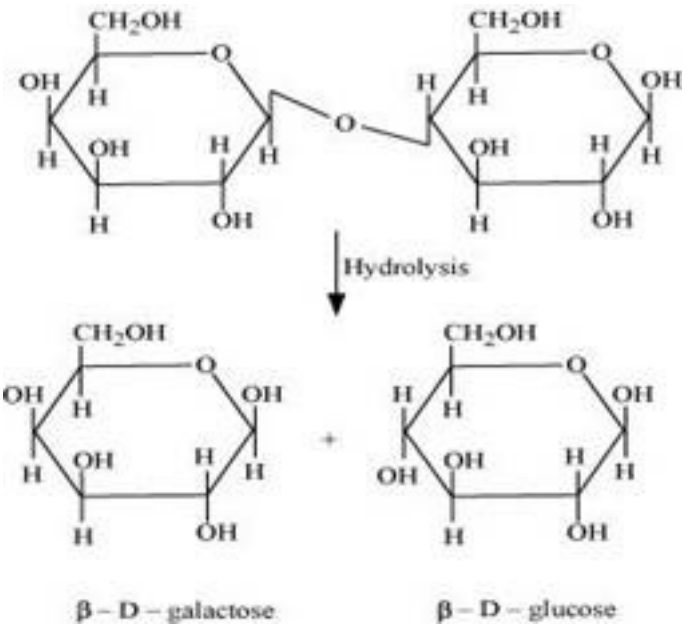
Surcose

6. What are the hydrolysis products of (i)sucrose and (ii)lactose?

Ans. (i) On hydrolysis, sucrose gives one molecule of α-D glucose and one molecule of β-fructose.



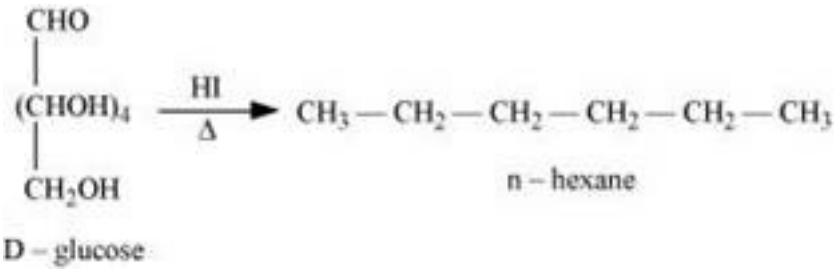
(ii) The hydrolysis of lactose gives β-galactose and β-glucose.



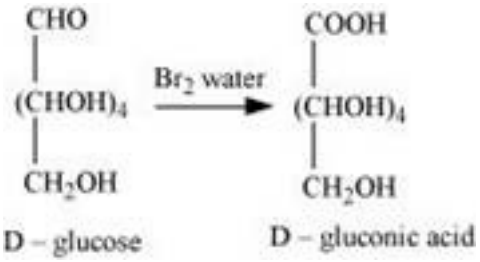
7. What happens when D-glucose is treated with the following reagents?

(i) HI (ii) Bromine water (iii) HNO_3

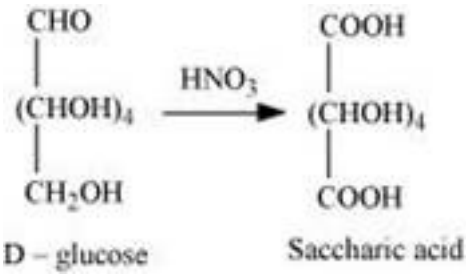
Ans. (i) When D-glucose is heated with HI for a long time, n-hexane is formed.



(ii) When D-glucose is treated with Br_2 water, D- gluconic acid is produced.



(iii) On being treated with HNO_3, D-glucose get oxidised to give saccharic acid.



8. Enumerate the reactions of D-glucose which cannot be explained by its open chain structure.

Ans. (1) Aldehydes give 2, 4-DNP test, Schiff's test, and react with $NaHSO_4$ to form the hydrogen sulphite addition product. However, glucose does not undergo these reactions.

(2) The pentaacetate of glucose does not react with hydroxylamine. This indicates that a free -CHO group is absent from glucose.

(3) Glucose exists in two crystalline forms - α and β. The α form (m.p. = 419 K) crystallises from a concentrated solution of glucose at 303 K and the β form (m.p = 423 K) crystallises from a hot and saturated aqueous solution at 371 K. This behavior cannot be explained by the open chain structure of glucose.

9. Differentiate between globular and fibrous proteins.

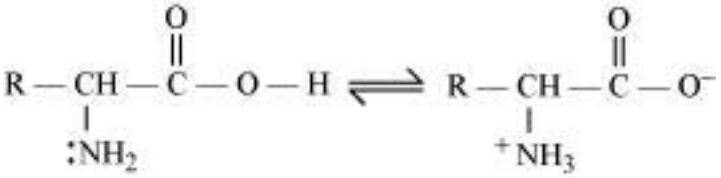
Ans.

Fibrous protein		Globular protein	
1.	It is a fibre-like structure formed by the polypeptide chain. These proteins are held together by strong hydrogen and disulphide bonds.	1.	The polypeptide chain in this protein is folded around itself, giving rise to a spherical structure.
2.	It is usually insoluble in water.	2.	It is usually soluble in water.
3.	Fibrous proteins are usually used for structural purposes. For example, keratin is present in nails and hair; collagen in tendons; and myosin in	3.	All enzymes are globular proteins. Some hormones such as insulin are also

	muscles.		globular proteins.

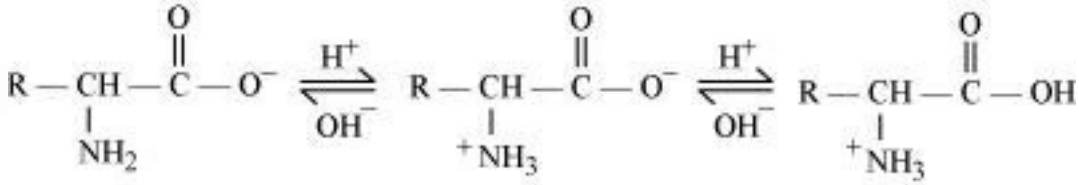
10. How do you explain the amphoteric behavior of amino acids?

Ans.I n aqueous solution, the carboxyl group of an amino acid can lose a proton and the amino group can accept a proton to give a dipolar ion known as zwitter ion.



Zwitter ion

Therefore, in zwitter ionic form, the amino acid can act both as an acid and as a base.



Thus, amino acids show amphoteric behaviour.

11. What are enzymes?

Ans. Enzymes are proteins that catalyse biological reactions. They are very specific in nature and catalyse only a particular reaction for a particular substrate. Enzymes are usually named after the particular substrate or class of substrate and sometimes after the particular reaction.

For example, the enzyme used to catalyse the hydrolysis of maltose into glucose is named as maltase.

Again, the enzymes used to catalyse the oxidation of one substrate with the simultaneous reduction of another substrate are named as oxidoreductase enzymes.

The name of an enzyme ends with '– ase'.

12. What are nucleic acids? Mention their two important functions.

Ans. Nucleic acids are biomolecules found in the nuclei of all living cells, as one of the constituents of chromosomes. There are mainly two types of nucleic acids - deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). Nucleic acids are also known as polynucleotides as they are long-chain polymers of nucleotides.

Two main functions of nucleic acids are:

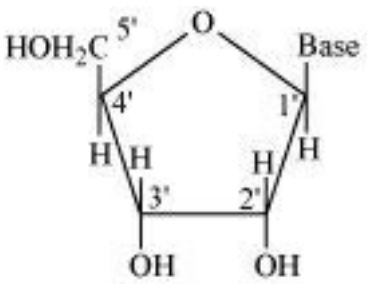
(i) DNA is responsible for the transmission of inherent characters from one generation to the next. This process of transmission is called heredity.

(ii) Nucleic acids (both DNA and RNA) are responsible for protein synthesis in a cell. Even though the proteins are actually synthesised by the various RNA molecules in a cell, the message for the synthesis of a particular protein is present in DNA.

13. What is the difference between a nucleoside and a nucleotide?

Ans. A nucleoside is formed by the attachment of a base to $1'$ position of sugar.

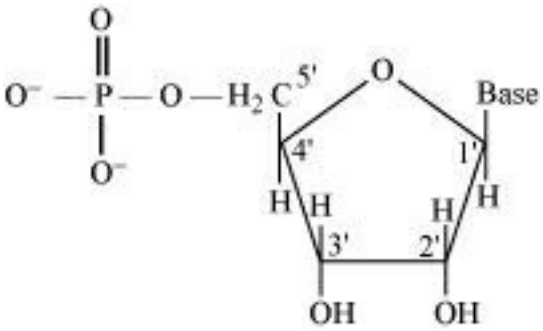
Nucleoside = Sugar + Base



Structure of a nucleoside

On the other hand, all the three basic components of nucleic acids (i.e., pentose sugar, phosphoric acid, and base) are present in a nucleotide.

Nucleotide = Sugar + Base + Phosphoric acid



Structure of a nucleotide