NCERT SOLUTIONS
CLASS-XII CHEMISTRY
CHAPTER-14
BIOMOLECULES

Q 1. Explain monosaccharide?

Ans:

Monosaccharides know as simple sugars comprise of one sugar unit that cannot be further broken down into simple sugars.

We can classify a monosaccharide on the basis of number of carbon atoms and the functional group present in them. The monosaccharide which contains an aldehyde group is termed as aldoses and those which have keto group are called ketoses. Depending on the number of carbon atoms present in an monosaccharide it is further classified as trioses, tetroses, pentoses, hexoses, and heptoses. As for example, we can call a aldose which contains 3 carbon atoms as aldotriose and a keto which conrains 3 carbon atom as ketotriose.

Q 2. Explain reducing sugars?

Ans:

Those type of carbohydrates which reduces the Fehling's solution and Tollen's reagent are termed as reducing sugars.

Q 3. What are two main functions of carbohydrates in plants?

Ans:

The two main functions of a carbohydrate in a plant are:

(a) Polysaccharides like starch acts as a storage molecules.

(b) Cellulose is used to build the cell wall, and it is a polysaccharide

Q 4. Categorise the given carbohydrates into monosaccharides and disaccharides.

2-deoxyribose, Ribose, maltose, lactose , galactose and fructose

Ans:

Monosaccharides : 2-deoxyribose, galactose, Ribose, fructose

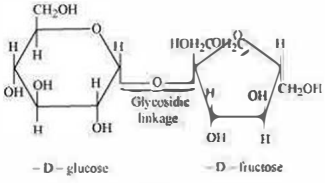
Disaccharides : lactose, Maltose

Q 5. What is meant by the term glycosidic linkage?

Ans:

The linkage which forms by the loss of water between two monosaccharide units through an oxygen atom is known as glycosidic linkage.

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



Sucrose

Q 6. Explain glycogen. What are the difference between starch and glycogen?

Ans:

Glycogen also termed as animal starch is found only in animals. It is a polysaccharide.

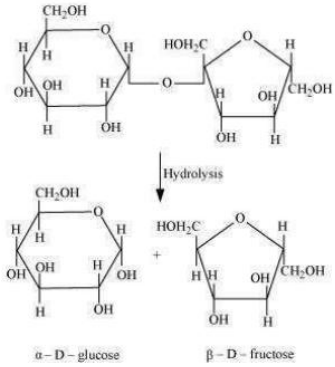
Both Glycogen and starch are main sources of glucose that provides energy to humans that are later converted into carbohydrates.

They differ in structure. Starch comprises of a chain and a branched compound whereas glycogen is composed of a single molecule and it is branched.

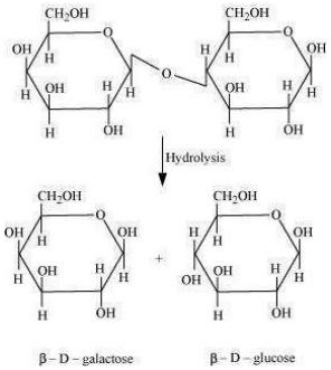
Q 7. What will be the product after hydrolysing the (a) sucrose and (b) lactose?

Ans:

(a) The hydrolysis of sucrose will give one molecule of α -D glucose and one molecule of β –D fructose.



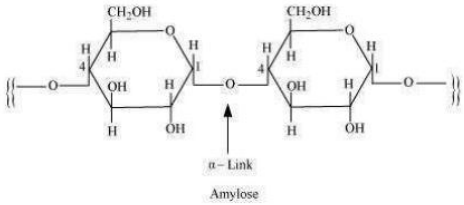
(b) On hydrolysis of lactose, it will give β -D-galactose and β -D-glucose.



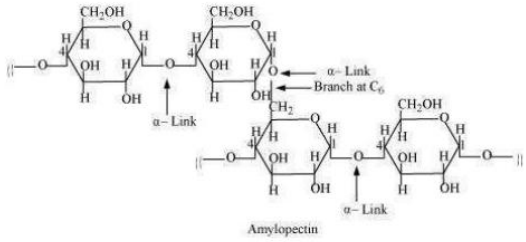
Q 8. What is the difference in structures between cellulose and starch?

Ans:

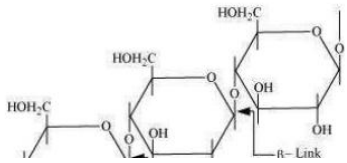
Starch consists of two components – amylopectin and amylose. Amylose have a longer linear chain of α – D –(+)–glucose units joined by C1–C4 glycosidic linkage (α -link).

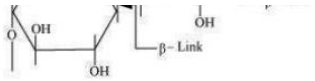


While amylopectin is a branched-chain polymer of α -D-glucose units, in which the chain is formed by C1–C4 glycosidic linkage and the branching occurs by C1–C6 glycosidic linkage.



While, cellulose is a straight-chain polysaccharide of β – D-glucose units joined by C1–C4 glycosidic linkage (β – link).





Q 9. What will happen when a D – glucose is treated with the reagents given below?

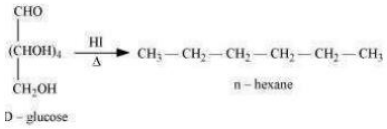
(a) HI

(b) Bromine water

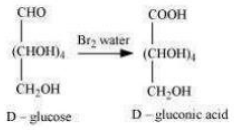
(b) HNO_3

Ans:

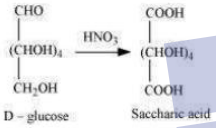
(a) After heating a D-glucose with HI for long time, n-hexane is formed.



(b) After treating a D-glucose with Br_2 water, D- gluconic acid is produced.



(c) After treating with HNO_3 , D – glucose get oxidised to give saccharic acid.



Q 10. List all the reactions of D- glucose which a open chain structure can't be explain.

Ans:

(i) The pentaacetate of glucose does not react with hydroxylamine. This shows that a free −CHO group is not present in glucose.

(ii) Aldehydes forms the hydrogen sulphite additional product by giving 2,4 – DNP test, Schiff's test and react with $NaHSO_4$. But glucose does not undergo these reactions.

(iii) Glucose is available 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 behaviour can't be explained by the open chain structure of glucose.

Q 11. Explain what an essential amino acid is and what a non – essential amino acid is? Also give two examples for each the types.

Ans:

Those amino acids which are required by the human body is called essential amino acids, but these cannot be produced inside the human body. They must be taken from any external source like food. As for example: leucine and valine.

Those acids which are required by the human body but these type of acids can be produced inside the body are called non – essential amino acids. Example: glycine and alanine.

Q 12. Relate the following with proteins.

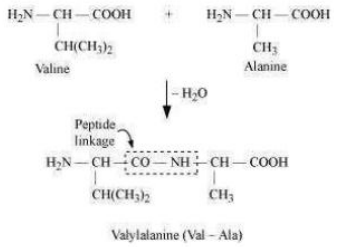
(a) Primary Structure (b) Peptide Linkage (c) Denaturation

Ans:

(a) **Primary Structure**

We can refer to the specific sequence, in which various amino acids are present, if we talk about the primary structure of protein. Like the sequence of linkage between amino acid in a polypeptide chain.

The amino acids are arranged in different sequence in each of the proteins. A little difference in the sequence of the arrangements will create a completely different protein.



(b) **Peptide Linkage**

A peptide linkages is the amide which is formed by the elimination of a water molecule between the –COOH group of one molecules of an amino acid and $-NH_2$ group of another molecule of the amino acid.

(c) **Denaturation**

A protein has a unique 3 – dimensional structure and a unique biological activity inside a biological system. In these type of circumstances proteins are called a native protein. Whenever we put a native protein into a physical change like change in temperature or any chemical changes like change in pH, then there its H – bonds are disturbed or changes.

This result in the unfolding of the globules ad uncoils the helix. And the consequences of this change are that the protein results in the loss of its biological activity. This loss of biological activity by the protein is called denaturation. During this process, no changes are encountered in primary structure whereas tertiary and secondary structures will be destroyed.

Example for denaturation, proteins is the coagulation of egg white when an egg is boiled.

Q 13. What are the common types of secondary structure of proteins?

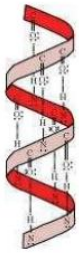
Ans:

Secondary structures of proteins are of two types:

(a) α – helix structure

(b) β – pleated sheet structures.

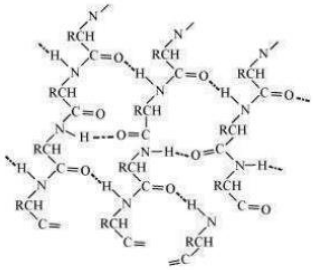
α – helix structure



In this structure, the −NH group of an amino acid residue forms H-bond with the

Group of the adjacent turn of the right – handed screw (α – helix).

β – pleated sheet structures.



This structure is called so because it looks like the pleated folds of drapery. In this structure, the peptide chains are laid side by side after stretching out needs the maximum

This structure is called so because it looks like the pleated folds of drapery. In this structure, the peptide chains are laid side by side after stretching out near to the maximum extension. The intermolecular hydrogen bond keeps the peptide chain together.

Q 14. What type of bonding helps in stabilising the α -helix structure of proteins?

Ans:

The H-bonds formed between the −NH group of each amino acid residue and the

Group of the adjacent turns of the α -helix help in stabilising the helix.

Q 15. Differentiate between fibrous and globular proteins.

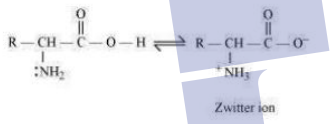
Ans:

	Globular protein		Fibrous protein
1.	The polypeptide chain in this protein is folded around itself, giving rise to a spherical structure.	1	It is a fibre-like structure formed by the polypeptide chain. These are the proteins which are held together by strong hydrogen and disulphide bonds.
2.	It is usually soluble 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 muscles.	3.	All enzymes are globular proteins. Some hormones such as insulin are also globular proteins.

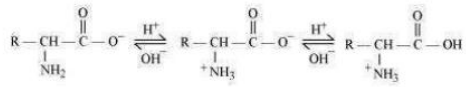
Q 16. Explain atmospheric behaviour of amino acid?

Ans:

In the presence of water or 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.



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



So. The amino acid show amphoteric behaviour.

Q 17. Explain what is an enzyme?

Ans:

The protein that catalyses the biological reactions are called enzymes. They are very particular in nature and for some specific substrate they catalyse particular reactions.

The enzymes are named after a particular reaction or in common bases, they are named after a paticular class of substrate.

Example: Maltase are the enzymes which are used to catalyse the hydrolysis of maltose into glucose.

$$\underset{\text{Maltose}}{C_{12}H_{22}O_{11}} \xrightarrow{\text{Maltase}} \underset{\text{Glucose}}{2C_6H_{12}O_6}$$

Also, oxidoreductase enzymes are those which are used to catalyse the oxidation of one substrate with the simultaneous reaction of another substrate.

The name of an enzyme ends with " – ase "

Q 18. What will be the outcome of denaturatuion on the structure of proteins?

Ans:

The outcome of denaturation, helixes get uncoiled and globules get unfolded. There would be no change in the primary structure of the protein while the secondary and the tertiary structure gets destroyed. We can say that the secondary and the tertiary – structured proteins are changed into the primary – structured proteins. Also, because of the loss of secondary and the tertiary structure the enzymes losses its activity.

Q 19. How can vitamins be classified? Name the vitamin which is a reason for the coagulation of blood.

Ans:

We can classify vitamins on the basis of solubility in water or fat into two categories.

(a) Water Soluble vitamins: Vitamins which are soluble in water comes in category.

For example, B group vitamins ($B_1, B_2, B_{12},\ etc.$) and vitamin C.

(b) Fat soluble vitamins: Those vitamins which are soluble only in fat, not in water come under this group. For example: Vitamins A, D E, and K

However, biotin or vitamin H is neither soluble in water nor in fat.

The vitamin which is responsible for coagulation of blood is Vitamin K.

Q 20. Vitamin C and Vitamin C are essential to use. Why? Also list their important sources.

Ans:

These two vitamins are essential to us because the deficiency of these two vitamins causes us harmful disease like, the deficiency of vitamin causes us xerophthalmia (hardens the cornea of the eye) an night blindness. While the deficiency of vitamin C causes scurvy (bleeding gums).

The sources of these two vitamins are:

Vitamin A : Carrots, fish liver oil, milk and butter.

Vitamin C : amla, citrus fruits and green leafy vegetables.

Q 21. What are nuclic acids? Give their two important functions.

Ans:

It is a molecule which is found as one of the constituents of chromosomes which is found in the nuclei of all the living cells.

Nucleic acid can be categorised into two categories: ribonucleic acid (RNA) and deoxyribonucleic acid (DNA).

Nucleic acids are a long – chain polymers of nucleotides, so they are also known as polynucleotides.

(i) It is responsible for heredity. In heredity there is a transfer of inherent characters from one generation to another. And this process is held by the DNA.

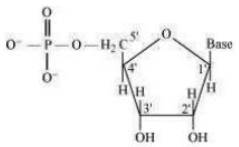
(ii) The protein cell synthesis is held by the Nucleic acid (both RNA and DNA). The protein synthesis is majorly done by the various RNA molecules in a cell while DNA contains the message for the synthesis of a specific protein.

Q 22. What is the difference between a nucleotide and a nucleoside?

Ans:

A Nucleotide is formed by the combination of all the three basic component of nucleic acids (i.e., base, pentose sugar, and phosphoric acid).

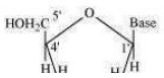
Therefore, Nucleotide = Base + Sugar + Phosphoric acid

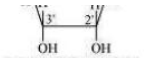


Structure of a nucleotide

On the other hand, A nucleoside is formed by the attachment of a base to 1' position of sugar.

Nucleoside = Sugar + Base





Structure of a nucleoside

Q 23. Explain the term "The two strands in DNA are not identical but are complementary".

Ans:

In the helical structure of DNA, the hydrogen bond holds the two strands between specific pairs of bases. Adenine forms hydrogen bond with thymine, while cytosine forms hydrogen bond with guanine. SO, as its result, the two strands acts as a complementary for each other.

Q 24. Differentiate between NDA and RNA on the basis of their functions and structures. .

Ans:

The difference on the basis of their functions is:

DNA		RNA	
1	DNA is the chemical basis of heredity.	1	RNA is not responsible for heredity.

The differences on the basis of their structures are as follows:

DNA		RNA	
1	The sugar moiety in DNA molecules is β-D-2 deoxyribose.	**1**	The sugar moiety in RNA molecules is β-D-ribose.
2	DNA contains uracil (U). It does not contain thymine (T).	**2**	RNA does not contain uracil (U). It contains thymine (T).
3	The helical structure of DNA is double-stranded.	**3**	The helical structure of RNA is single-stranded.

Question 14.25:

State the different types of RNA found in the cell?

Answer

(i) Messenger RNA (m-RNA)

(ii) Ribosomal RNA (r-RNA)

(iii) Transfer RNA (t-RNA)