Chapter 14 BIOMOLECULES

Level one questions

1.Name the sugar present in milk.
A: Lactose

2.How many monosaccharide units are present in it?
A: two monosaccharide units are present.

3.What are such oligosaccharides called?
A: Such oligosaccharides are called disaccharides

4. How do you explain the presence of all the six carbon atoms in glucose in a straight chain?
A: On prolonged heating with HI, glucose gives *n*-hexane.

5.Name the linkage connecting monosaccharide units in polysaccharides.
A: Glycosidic linkage.

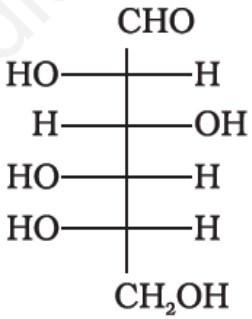
6.Under what conditions glucose is converted to gluconic and saccharic acid?
A: Glucose is converted to gluconic acid by bromine water and to saccharic acid by conc. HNO_3.

7.Which sugar is called invert sugar?
A: Sucrose.

8.During curdling of milk, what happens to sugar present in it?
A: It converts into Lactic acid.

9. Monosaccharide contain carbonyl group hence are classified, as aldose or ketose. The number of carbon atoms present in the monosaccharide moleculeare also considered for classification. In which class of monosaccharide willyou place fructose?
A:Fructose is a ketohexose.

10.The letters 'D' or 'L' before the name of a stereoisomer of a compound indicate the correlation of configuration of that particular stereoisomer. This refers to their relation with one of the isomers of glyceraldehyde. Predict whether the following compound has 'D' or 'L' configuration.



A: 'L' configuration

11.What are constituents of Starch?
A: Amylose and Amylopectin
12.What D N A & R N A Stand for?
A: Deoxyribonuclic acid and Ribonuclic acid.

13.What are Zwitter ions?
A: A Zwitter ion is a dipolar ion formed by neutralisation of acidic and basic centers present within the molecule .

14.What is non reducing sugar? Give example.

A: The groups like CHO, - C= O, which are not freely available in the molecule do not answer tollens or fehlings test are called non reducing sugar. E.g. maltose and lactose

15.Define mutarotation? Give example.

A: The anomers of glucose i. e. alpha and beta are having specific rotation of + 111 ^{0}Cand + 19.2^{0}Crespectively. The mixtures of these two have a rotation of +52.4^0 C. this is called a mutarotation.

16.Amino acids are amphoteric in behavior? Explain.

A: they form zwitterion(dipolar ion) and behave as neutral molecule at pH 7(isoelectric point)

Level Two Questions

1.Define native state and denaturation of protein.

What happens when:

a. Protein is cooled to zero degree C?
b. Protein is heated to 80^0 C

A: protein in the native state has definite configuration and biological activity. The higher structure of protein is affected without disturbing the primary structure is called denaturation.

a. no change

b.the coagulation of the protein takes place.

2. Which forces are responsible for stability of alpha Helix of protein? Why it is called 3.6_{13} helix?

A: Hbonding. It has 3.6 amino acids in one single turn,and a 13 member ring is formed by H bonding.

3. What are essential amino acids? Give example and what happens when it is polymerized?

A: amino acids required by the body and cannot be synthesized in our body are called essential amino acids. e.g. Lysine. When it is polymerized polypeptide chains are formed.

4. Glucose and sucrose are soluble in water but Cyclohexane and benzene are not soluble. Why?

A : Glucose and sucrose form H bonding with water

5.(i) Write the sequence of base on mRNA molecule synthesized on the following strand of DNA: TATCTACCTGGA

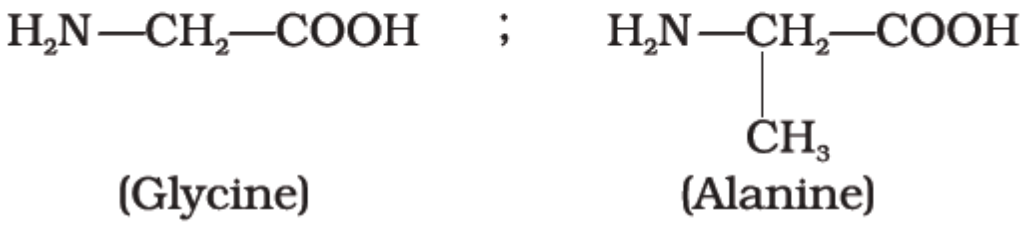
A: AUAGAUGGACCU

(ii)Name a powerful antioxidant which is a water soluble vitamin.

A: Vitamin C

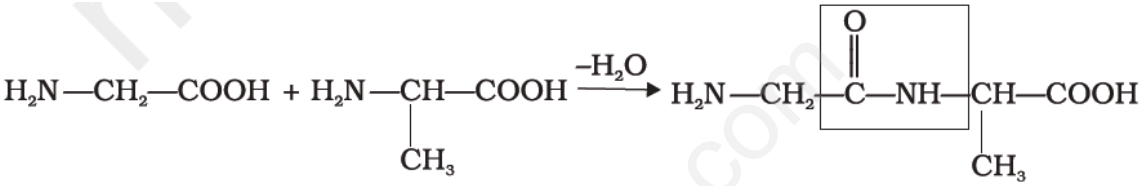
6.(i)Protein found in a biological system with a unique three-dimensional structureand biological activity is called a native protein. When a protein in its native form,is subjected to a physical change like change in temperature or a chemical changelike, change in pH, denaturation of protein takes place. Explain the cause.

(ii) Structures of glycine and alanine are given below. Show the peptide linkage in glycylalanine.



(Glycine) (Alanine)

Ans: A(i) Due to physical or chemical change, hydrogen bonds in proteins are disturbed, globules unfold and helix gets uncoiled therefore protein loses its biological activity. This is called denaturation of proteins.
(ii)



(Glycine) (Alanine) (Glycylalanine)

7. (i) What are the expected products of hydrolysis of lactose?
(ii) How do you explain the absence of aldehyde group in thepentaacetate of D-glucose?
A(i)It is composed of β-D-galactose and β-D-glucose. The linkage is between C1 of galactose and C4 of glucose.
(ii) The pentaacetate of glucose does not react with hydroxylamine indicating the absence of free —CHO group.

8. (i) What products would be formed when a nucleotide from DNA containing thymine is hydrolysed?
(ii)How will you distinguish 1° and 2° hydroxyl groups present in glucose?
A(i)Complete hydrolysis of DNA yields a pentose sugar, phosphoricacid and thymine
(ii)On oxidation with nitric acid, glucose as well as gluconic acid both yield a dicarboxylic acid, saccharic acid. This indicates the presence of a primary alcoholic (–OH) group in glucose.

9.Write the reactions of D-glucose which can't be explained by its open-chain structure. How can cyclic structure of glucose explain these reactions?
Ans: The following reactions and facts could not be explained by this structure.
Despite having the aldehyde group, glucose does not give Schiff's test and it does not form the hydrogensulphite addition product with NaHSO3.
The pentaacetate of glucose does not react with hydroxylamine indicating the absence of free —CHO group.
Glucose is found to exist in two different crystalline forms which are named as α and β. The α-form of glucose (m.p. 419 K) is obtained by crystallisation from concentrated solution of glucose at 303 K while the β-form (m.p. 423 K) is obtained by crystallisation from hot and saturated aqueous solution at 371 K.

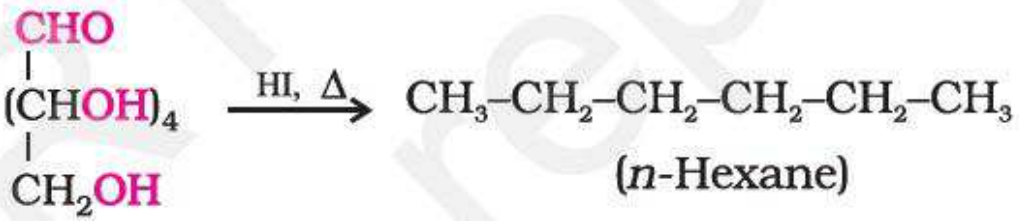
Level Three Questions

1. Write the evidences for the following on the basis open chain structure of Glucose.(I) all the six carbon atoms are linked in a straight chain.

(ii)the presence of a carbonyl group (>C = O) in glucose.

(iii)five –OH groups are attached to different carbon atoms.

Ans: (i)



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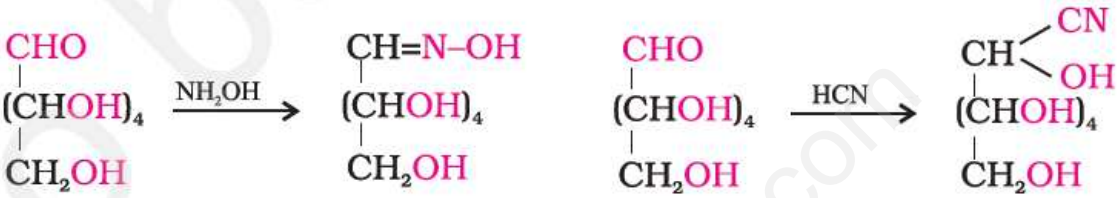
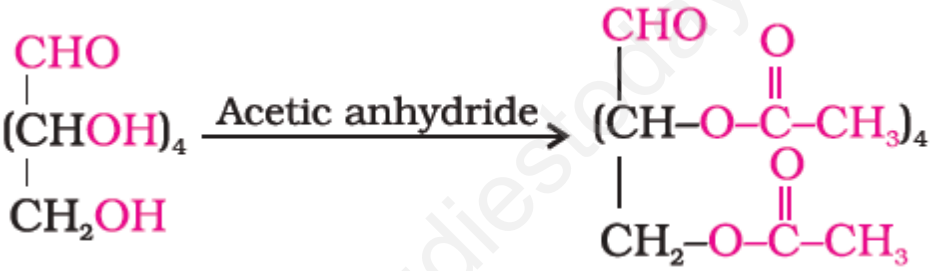


(iii)



2..Explain the terms primary structure of proteins.

Ans:- *Primary structure of proteins*: Proteins may have one or more polypeptide chains. Each polypeptide in a protein has amino acids linked with each other in a specific sequence and it is this sequence of amino acids that is said to be the primary structure of that protein. Any change in this primary structure i.e., the sequence of amino acids creates a different protein.

3. Explain the terms secondary structure of proteins. What is the difference between α-helix and β-pleated sheet structure of proteins?

*Ans: Secondary structure of proteins***:** The secondarystructure of protein refers to the shape in which a long polypeptide chain can exist. They are found to exist in two different types of structures viz. α-helix and β-pleated sheet structure. These structures arise due to the regular folding of the backbone of the polypeptide chain due to hydrogen bonding between-CO- and –NH– groups of the peptide bond. α-Helix is one of the most common ways in which a polypeptide chain forms all possible hydrogen bonds by twisting into a right handed screw (helix) with the –NH group of each amino acid residue hydrogen bonded to the C O of an adjacent turn of the helix.

In β-structure all peptide chains are stretched out to nearly maximum extension and then laid side by side which are held together by intermolecular hydrogen

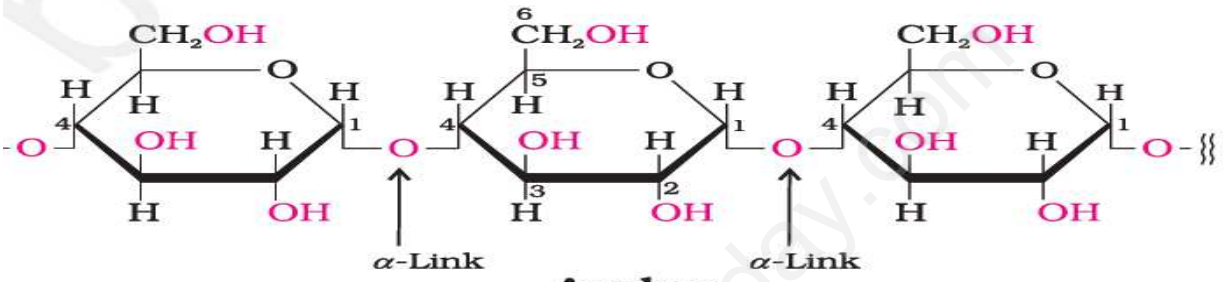
bonds. The structure resembles the pleated folds of drapery and therefore is known as β-pleated sheet.

4. Explain tertiary structure of Protein.

Ans: Tertiary structure of proteins: The tertiary structure of proteins represents overall folding of the polypeptide chains i.e., further folding of the secondary structure. It gives rise to two major molecular shapes viz. fibrous and globular. The main forces which stabilise the 2° and 3° structures of proteins are hydrogen bonds, disulphide linkages, van der Waals and electrostatic forces of attraction.

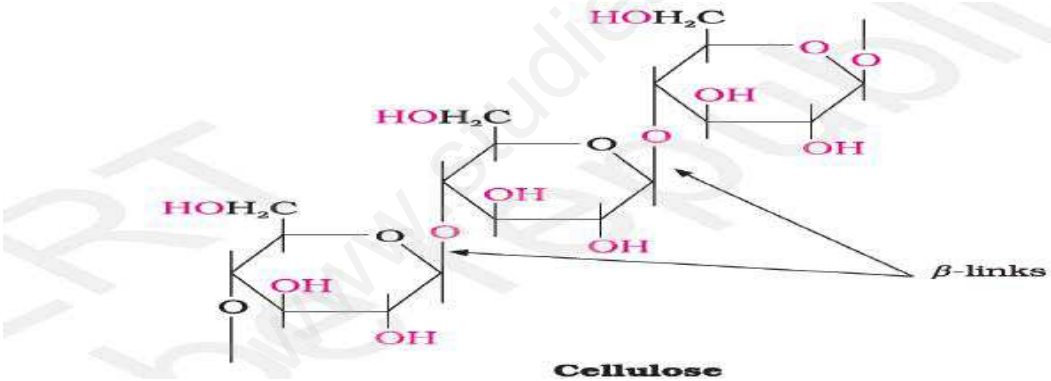
5.What are structural difference between Cellulose and Starch ?

Ans:-Starch is a polymer of α-glucose and consists of two components— **Amylose** and **Amylopectin**. Amylose is water soluble component which constitutes about 15-20% of starch. Chemically amylose is a long unbranched chain with 200-1000 α-D-(+)-glucose units held by C1–C4 glycosidic linkage.



Amylose

Cellulose is a straight chain polysaccharide composed only of β-D-glucose units which are joined by glycosidic linkage between C1 of one glucose unit and C4 of the next glucose unit.



Cellulose