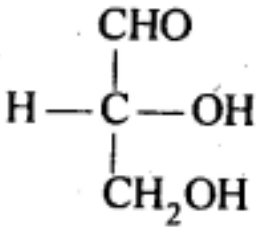
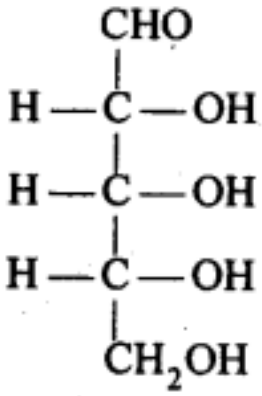
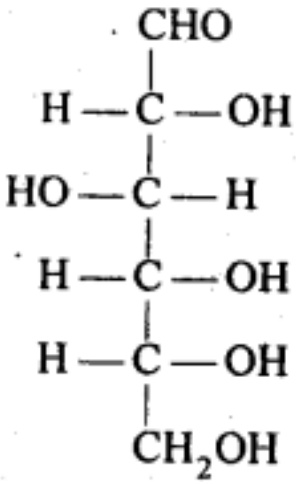
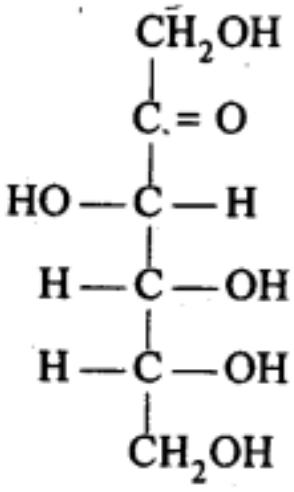
NCERT EXRECISES

14.1. What are monosaccharides ?
Ans: Monosaccharides are carbohydrates Which cannot be hydrolysed to smaller molecules.Their general formula is $(CH_2O)n$ Where n=3-7 These are of two types: Those which contain an aldehyde group (-CHO) are called aldoses and those which contain a keto (C=O) group are called ketoses.
They are further classified as trioses , tetroses ,pentoses , hexoses and heptoses according as they contain 3,4,5,6, and 7 carbon atoms respectively.For example.









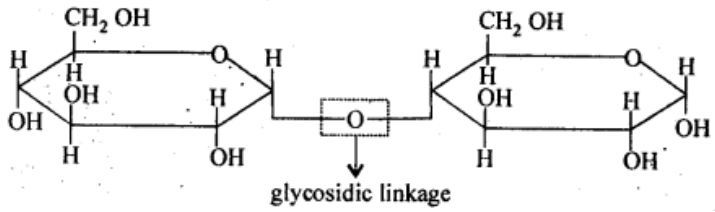
14.2. What are reducing sugars?
Ans: Carbohydrates which reduces Fehling's solution to red precipitate of Cu_2O or Tollen's reagent to metallic Ag are called reducing sugars. All monosaccharides (both aldoses and ketoses) and disaccharides except sucrose are reducing sugars. Thus, D - (+) - glucose, D-(-)-fructose, D - (+) - maltose and D - (+) - lactose are reducing sugars.

14.3. Write two main functions of carbohydrates in plants.
Ans: Two major functions of carbohydrates in plants are following
(a) Structural material for plant cell walls: The polysaccharide cellulose acts as the chief structural material of the plant cell walls.
(b) Reserve food material: The polysaccharide starch is the major reserve food material in the plants. It is stored in seeds and act as

the reserve food material for the tiny plant till it is capable of making its own food by photosynthesis.

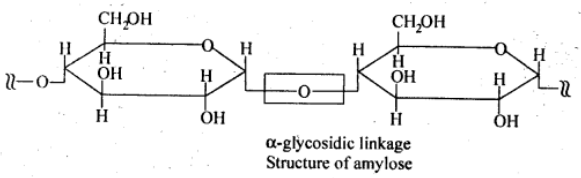
14.4. Classify the following into monosaccharides and disaccharides. Ribose, 2-deoxyribose, maltose, galactose, fructose and lactose.
Ans: Monosaccharides: Ribose, 2-deoxyribose, galactose and fructose. Disaccharides: Maltose and lactose.

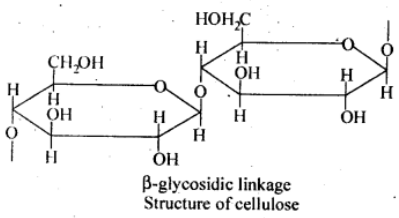
14.5. What do you understand by the term glycosidic linkage?
Ans: The ethereal or oxide linkage through which two monosaccharide units are joined together by the loss of a water molecule to form a molecule of disaccharide is called the glycosidic linkage. The glycosidic linkage in maltpse molecule is shown below:

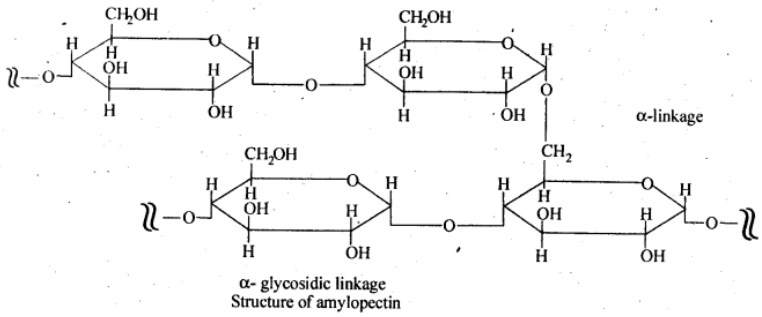


14.6. What is glycogen? How is it different from starch?
Ans: Glycogen is a condensation polymer of α-D glucose. Starch is not a single compound but is a mixture of two components—a water soluble component called amyldse (15- 20%) and water insoluble component amylopectin (80 - 85%). Amylose is a linear polymer of α - D - glucose. But both glycogen and amylopectin are branched polymers of α - D - glucose; father glycogen is more highly branched than amylopectin as amylopectin chains consists of 20 - 25 glucose units, glycogen chains consist of 10 - 14 glucose units.

14.7. What are the hydrolysis products of (i) sucrose, and (ii) lactose?
Ans: Both sucrose and lactose are disaccharides. Sucrose on hydrolysis gives one molecule each of glucose and fructose but lactose on hydrolysis gives one molecule each of glucose and galactose.

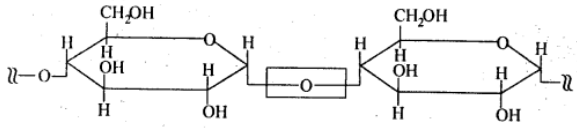




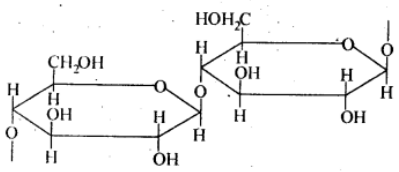


14.8. What is the basic structural difference between starch and cellulose?

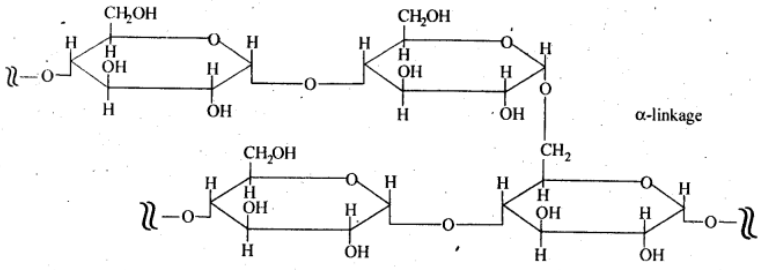
Ans: Starch consists of amylose and amylopectin. Amylose is a linear polymer of α-D-glucose while cellulose is a linear polymer of β -D- glucose. In amylose, C -1 of one glucose unit is connected to C - 4 of the other through α-glycosidic linkage. However in cellulose, C - 1 of one glucose unit is connected to C-4 of the other through β - glycosidic linkage. Amylopectin on the other hand has highly branched structure.



α-glycosidic linkage
Structure of amylose

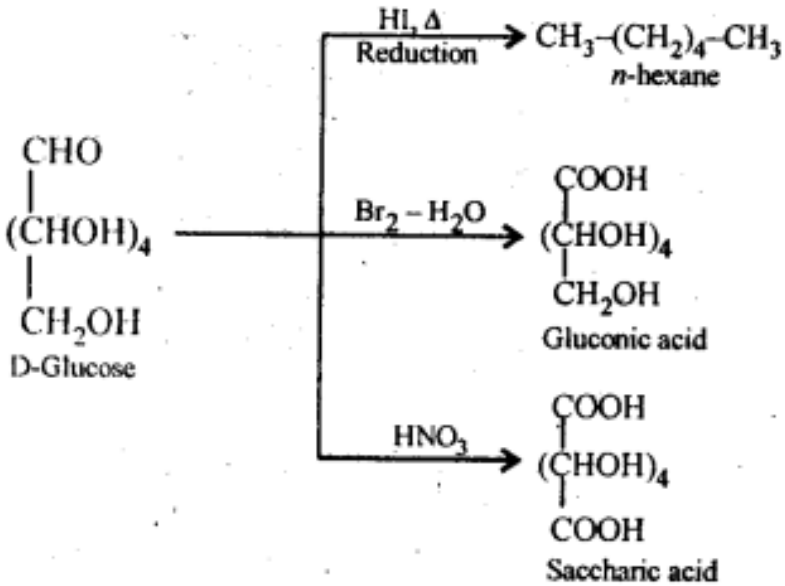


β-glycosidic linkage
Structure of cellulose



α- glycosidic linkage
Structure of amylopectin

14.9. What happens when D-glucose is treated with . the following reagents.
(i) HI (ii) Bromine water (iii) HNO_3
Ans:



14.10. Enumerate the reactions of D-glucose which cannot be explained by its open chain structure.
Ans:
(a) D (+) - glucose does not undergo certain characteristic reactions of aldehydes, e.g., glucose does not form $NaHSO_3$ addition product.
(b) Glucose reacts with NH_2OH to form an oxime but glucose pentaacetate does not. This implies that the aldehydic group is

absent in glucose pentaacetate.
(c) D - (+) - glucose exists in two stereoisomeric forms, i.e., α - glucose and β-glucose.
(d) Both α - D - glucose and β - D - glucose undergo mutarotation in aqueous solution. Although the crystalline forms of α- and β -D (+) - glucose are quite stable in aqueous solution but each form slowly changes into an equilibrium mixture of both.
(e) D (+) - glucose forms two isomeric methyl glucosides. Aldehydes normally react with two moles of methanol per mole of the aldehyde to form an acetal but D (+) - glucose when treated with methanol in presence of dry HCl gas, reacts with only one mole of methanol per mole of glucose to form a mixture of two methyl D - glucosides i. e., methyl - α - D - glucoside (melting point 43 8 K, specific rotation +158°) and methyl - β - D - glucoside (melting point 308 K, specific rotation - 33°).

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