CHAPTER 15

CARBOHYDRATES

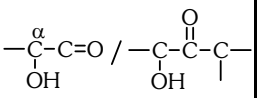
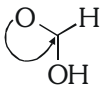
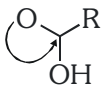
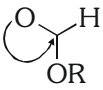
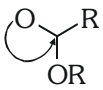
- Carbodydrates are defined as optically active polyhydroxy aldehydes or ketones or the compound which produce such units on hydrolysis.
- ***Monosaccharide*** ($C_nH_{2n}O_n$) : single unit, can't be hydrolysed : Glucose and fructose.
- ***Oligosaccharides*** gives two to ten monosaccharides on hydrolysis.
- ***Disaccharides*** (by glycosydic linkage)

  Sucrose $\xrightarrow{H_3O^+}$ α–D. Glucose + β–D. Fructose;

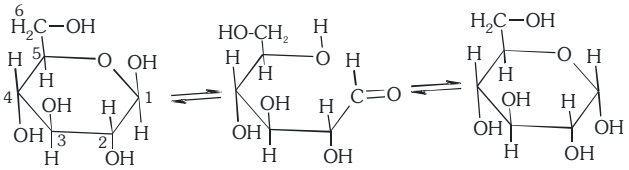
  Maltose $\xrightarrow{H_3O^+}$ 2 α–D. Glucose unit

  Lactose $\xrightarrow{H_3O^+}$ β–D. Glucose + β–D. Galactose
- ***Polysaccharide*** : Contain more than ten monosaccharide units

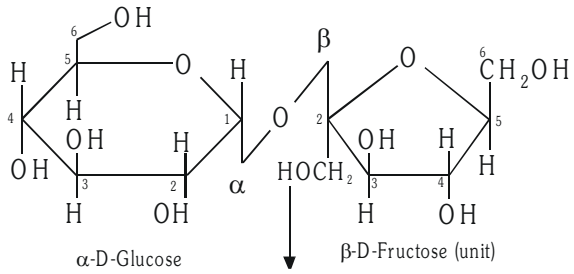
  $(C_6H_{10}O_5)_n$: Starch & cellulose.

TYPE OF SUGAR		
Give Test	**Reducing**	**Non Reducing**
Tollen's Reagent	+ve test	–ve test
Fehling Reagent	+ve test	–ve test
Benedict Test	+ve test	–ve test
Mutarotation	Yes	No
Functional Unit	  Hemiacetal  Hemiketal	 Acetal  Ketal
Example	All monosaccharides Glucose Fructose Mannose Galactose Disaccharide Maltose lactose	Disaccharide Sucrose Polysaccharide Starch cellulose

- ***Mutarotation:*** When either form of D-glucose is placed in aq. solution it slowly form the other via open chain aldehyde and gradual change in specific rotation until specific rotation (± 52.5°) is reached.

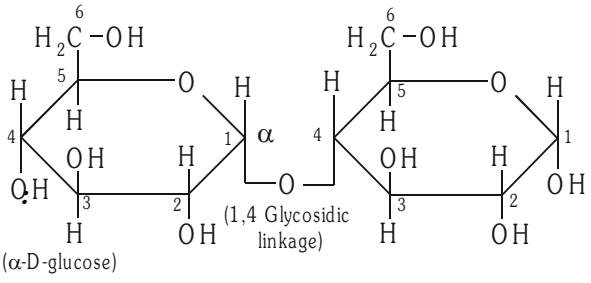


- ***Anomer's*** : Differ in configuration at 1st carbon due to hemi (acetal or ketal) ring formation. The new-asymmetric carbon is referred to as Anomeric carbon.
- ***Epimer's*** : Diastereomer's which differ in conformation at any one chiral carbon
  eg. D-Glucose & D-mannose
  D-Glucose & D-Galactose
- ***Sucrose :***



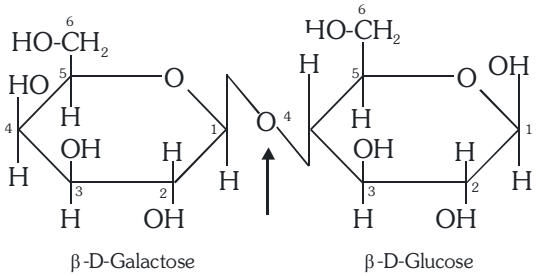
(1,2 Glycosidic linkage)

- ***Maltose***



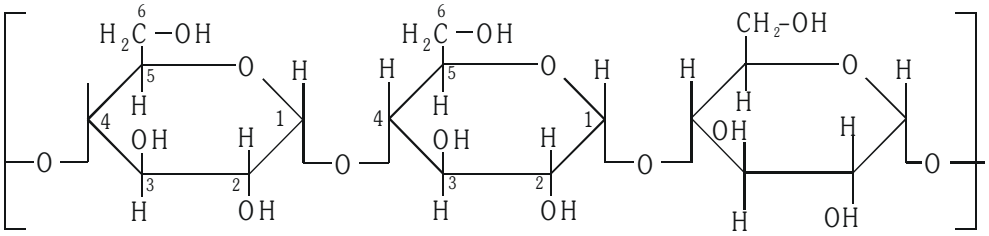
Two α-D-Glucose unit

- ***Lactose :***



(1,4 Glycosidic linkage)

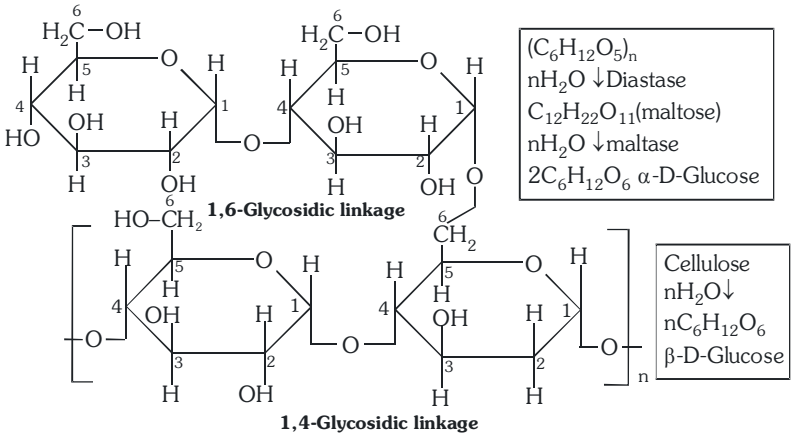
- ***Starch*** : (Amylose & Amylopectin)
- ***Amylose : (Straight Chain) :***



(α-1,4 Glycosidic linkage)

(i) Soluble in H_2O & gives blue colour with I_2

- ***Amylopectin (Branch chain) : $(C_6H_{12}O_5)_n$***



REACTION OF GLUCOSE (OPEN CHAIN STRUCTURE)