

Quadrant II – Transcript and Related Materials

Programme: Bachelor of Science (First Year)

Subject: Microbiology

Paper Code: MIC 101

Paper Title: Microbiology and Biochemistry - I

Unit: 6: Macromolecules

Module Name: Carbohydrates: Disaccharides- Maltose, Lactose and Sucrose, Reducing and Non Reducing sugars.

Module No: 39

Name of the Presenter: Mr. Anchit R. Shet Parker

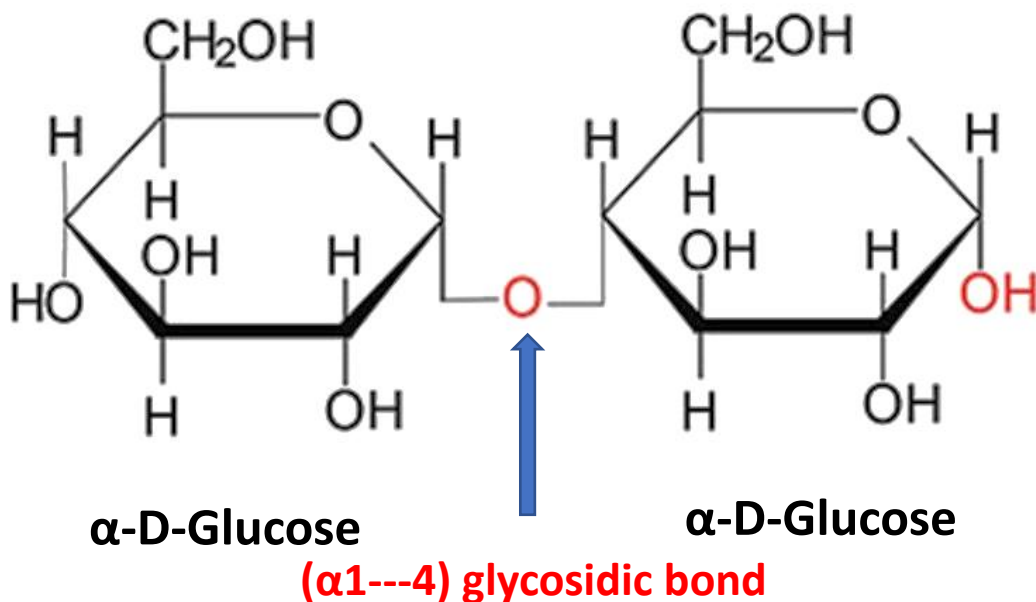
Notes:

Disaccharides

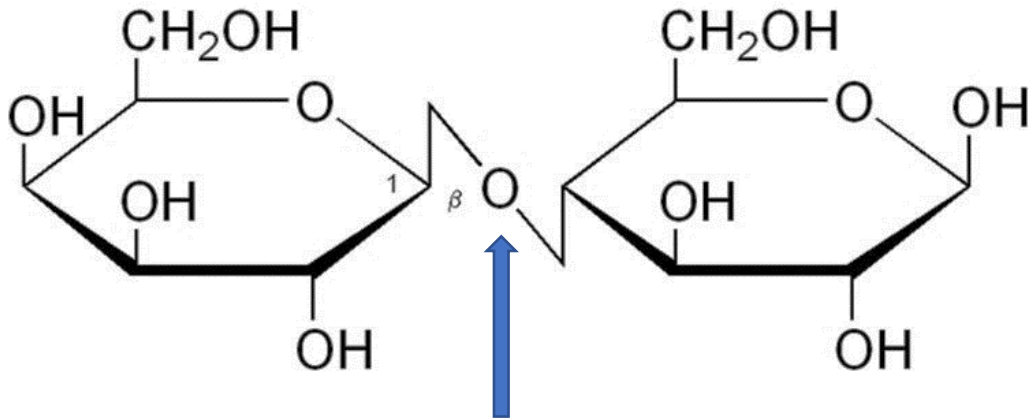
When two monosaccharides are combined together with elimination of a water molecule it is called disaccharide. Monosaccharides are combined by glycosidic bond.

Disaccharide	Description	Component monosaccharides
Sucrose	common table sugar	glucose α 1-2 fructose
Maltose	product of starch	glucose α 1-4 glucose
Trehalos	hydrolysis found in fungi	glucose α 1-1 glucose
eLactose	main sugar in milk	galactose β 1-4 glucose
Melibiose	found in legumes	galactose β 1-6 glucose

Maltose



Lactose

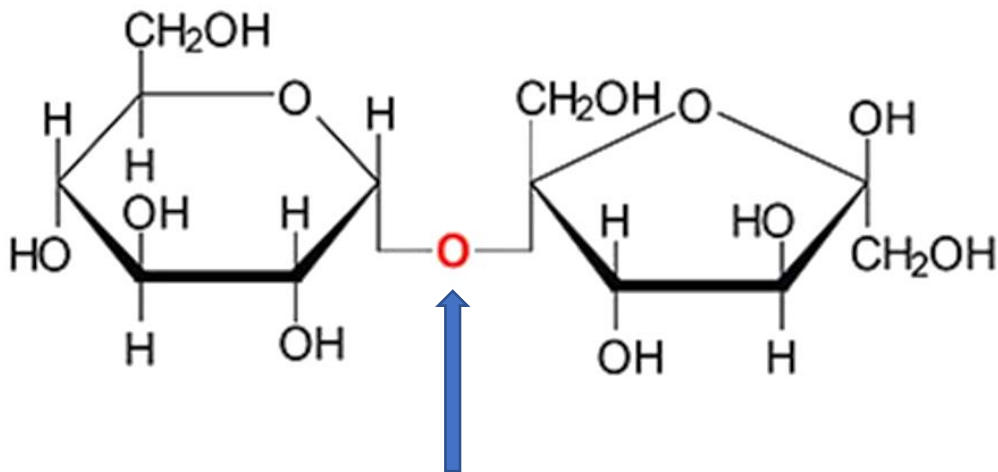


(β 1---4) glycosidic bond

β -D-Galactose

β -D-Glucose

Sucrose



(α 1---2 β) glycosidic bond

α -D-Glucose

β -D-Fructose

Sucrose also called saccharose, is ordinary table sugar refined from sugar cane or sugar beets. Sucrose is not a reducing sugar. This is because the glycosidic linkage involves first carbon of glucose and second carbon of fructose, and hence there is no free reducing groups. When sucrose is hydrolysed the resulting products have reducing property. Hydrolysis of sucrose (optical rotation $+66.5^\circ$) will produce one molecule of glucose ($+52.5^\circ$) and one molecule of fructose (-92°). Therefore, the products will change the dextrorotation to laevorotation, or the plane of rotation is inverted. Equimolecular mixture of glucose and fructose thus formed is called invert sugar.

Reducing and Non-reducing Sugars

The carbohydrates may also be classified as either reducing or non-reducing sugars. Cyclic acetals or ketals are not in equilibrium with their open chain carbonyl group containing forms in neutral or basic aqueous solutions. They cannot be oxidized by reagents such as Tollen's reagent (Ag^+ , NH_3 , OH^-) or Br_2 . So, these are referred as non-reducing sugars. Whereas hemiacetals or hemiketals are in equilibrium with the open chain sugars in aqueous solution. These compounds can reduce an oxidizing agent (eg. Br_2), thus, they are classified as a reducing sugar.

- Any carbohydrate that reacts with an oxidising agent to form an aldonic acid is classified as a reducing sugar.
- They have free aldehyde or ketone groups.
- All monosaccharides whether aldoses or ketoses, in their hemiacetal or hemiketal form are reducing sugars.
- Reducing sugars have the capacity to reduce cupric ion of Fehling's or Benedict's reagent.
- They exhibit mutarotation
- All disaccharides except Sucrose and Trehalose are reducing sugars \rightarrow they are not capable of reducing ferric or cupric ion.
- In disaccharides like Sucrose and Trehalose \rightarrow anomeric carbon of both monosaccharides participates in glycosidic bond formation, so no free anomeric carbon atom.
- They do not exhibit mutarotation