CHEMISTRY

(FOR IIT-JEE/ NEET)

Class – XII

Chapter : Biomolecules

Topic: Disaccharides |Examples | Structure

➢Disaccharides

➢Such carbohydrates which yield two same or different monosaccharide units on hydrolysis with dilute acids or enzymes are called disaccharides.

➢In disaccharides the two monosaccharides are joined together by an oxide linkage formed by the loss of a water molecule. Such a linkage between two monosaccharide units through oxygen atom is called **glycosidic linkage.**

- In disaccharides, if the reducing groups of both the monosaccharides i.e., aldehydic or ketonic groups are bonded, then they are not capable to reduce Fehling's solution and Tollens' reagent. Hence, they are said to be non-reducing sugars, e.g., sucrose.
- On the other hand, such sugars which contain either one or both of the functional groups in free state, are capable to reduce Fehling's solution and Tollen's reagent. Hence, they are called reducing sugars. For example, maltose and lactose.

(1)Sucrose

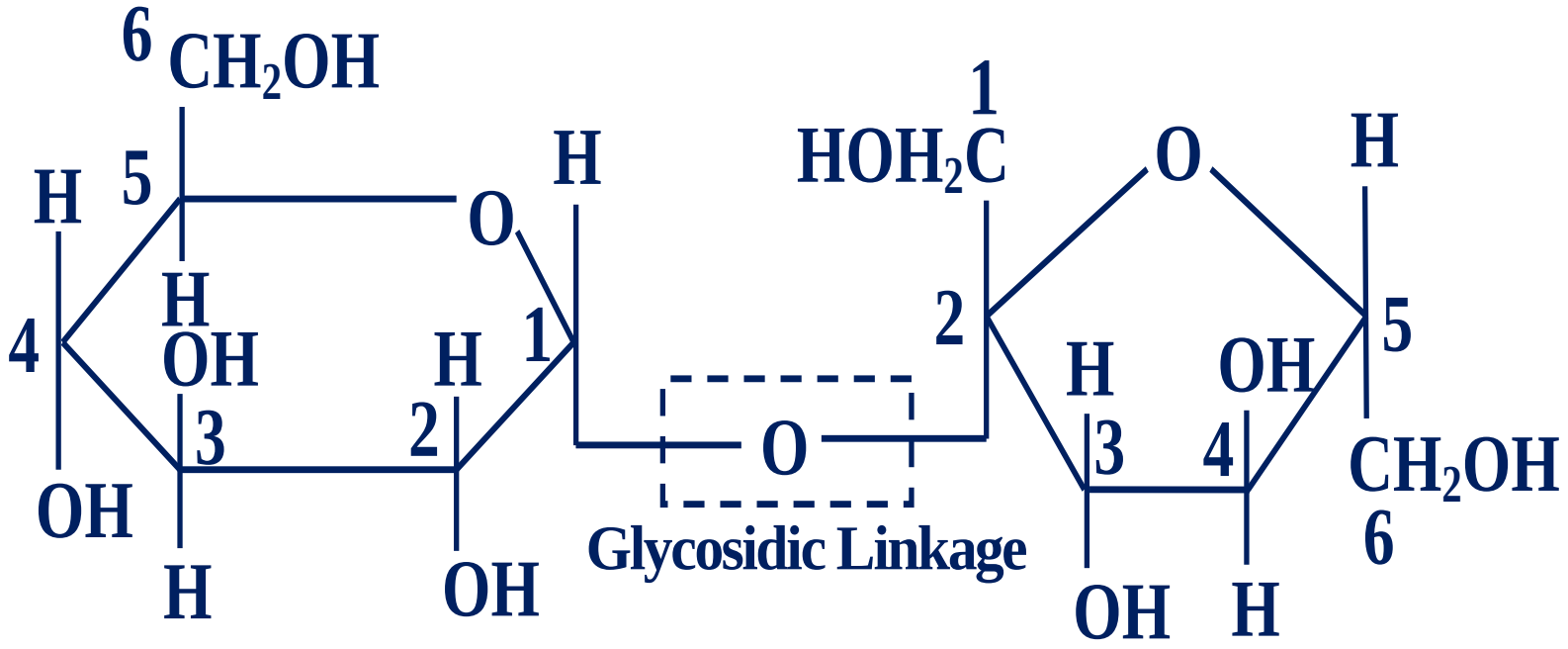
- It is one of the most common disaccharides which on hydrolysis gives equimolar mixture of D-(+)-glucose and D-(-) fructose.

$$C_{12}H_{22}O_{11} + H_2O \rightarrow C_6H_{12}O_6 + C_6H_{12}O_6$$

Sucrose — D-(+)-Glucose — D-(-)-Fructose

- Thus, sucrose is consisting of D-(+)-glucose and D-(-) fructose.

- In sucrose molecule, these two monosaccharides are held together by a glycosidic linkage between C_1 of α-D-glucose and C_2 of β-D-fructose.
- Since, the reducing groups of glucose and fructose i.e. carbonyl groups are involved in glycosidic bond formation, sucrose is not capable to reduce Fehling's solution and Tollens' reagent. Hence, it is an example of a non reducing sugar.



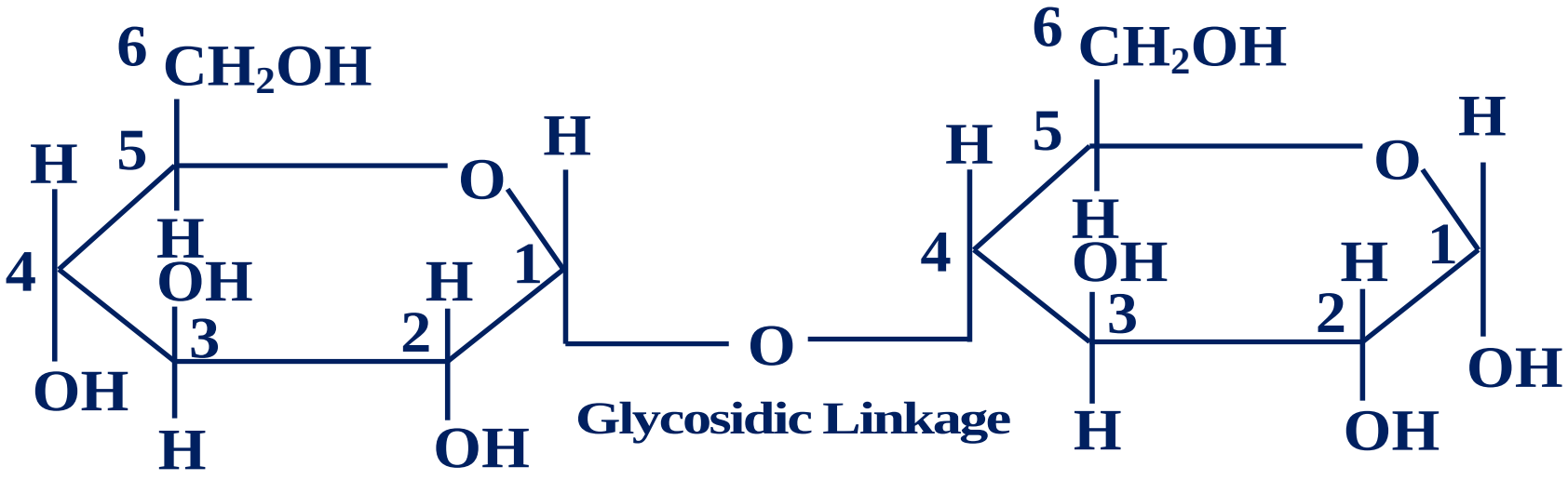
α - D - (+) - Glucopyranose β-D-(-)-Fructofuranose

Structure of Sucrose

- Sucrose is dextrorotatory, but after hydrolysis gives dextrorotatory glucose and laevorotatory fructose.
- Here, since the laevorotation of fructose (-92.4°) is more than dextrorotation of glucose (+52.5°), the mixture is laevorotatory.
- Thus, hydrolysis of sucrose brings about a change in the sign of rotation, from dextro (+) to laevo (-) and therefore, the product is named as **invert sugar**.

(2)Maltose

- Maltose (disaccharide) is composed of two α-D-glucose units, where C_1 of one glucose (I) is linked to C_4 of another glucose unit (II).
- Here, free aldehyde group can be produced at C_1 of second glucose in solution and therefore, it shows reducing properties and is an example of a reducing sugar.

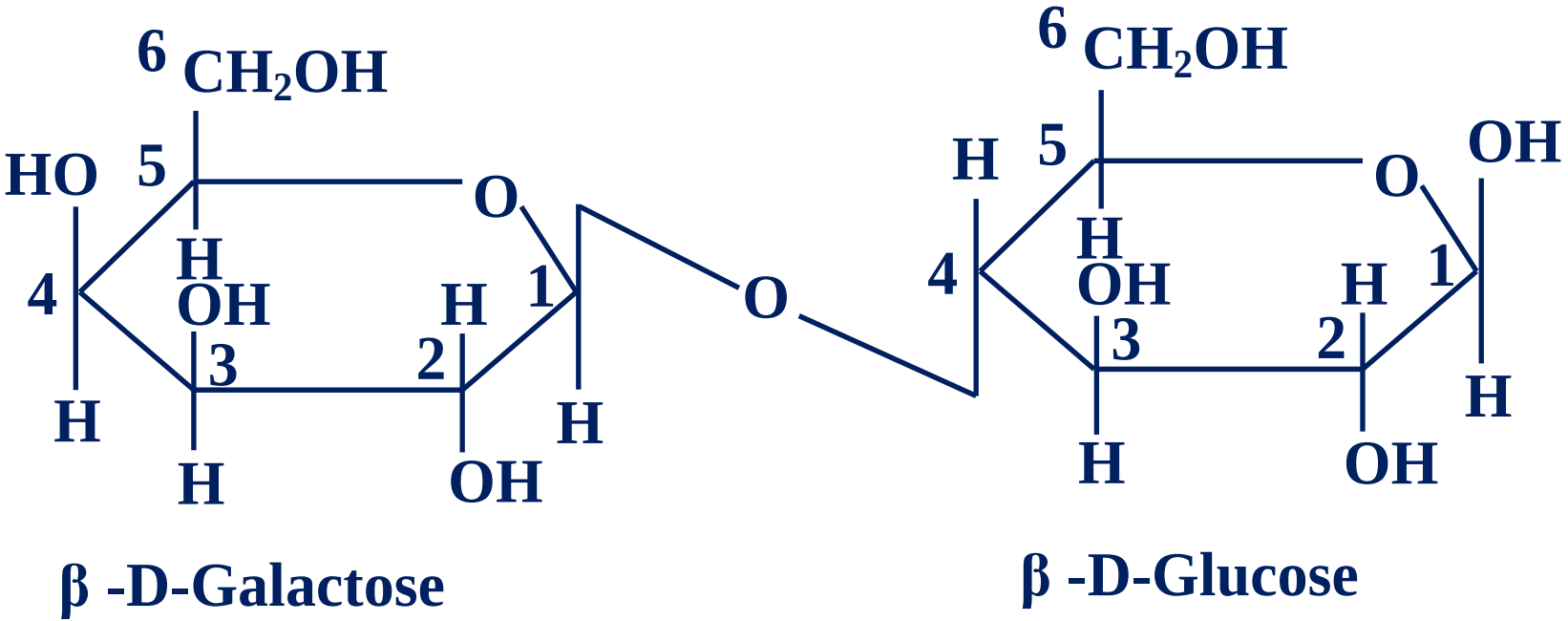


α - D - (+) - Glucopyranose α - D - (+) - Glucopyranose

Structure of Maltose

(3)Lactose

- It is a disaccharide which is found in milk and therefore, it is more commonly known as milk sugar.
- It is composed of β-D-galactose and β-D-glucose.
- The linkage is between C_1 of galactose and C_4 of glucose.
- Free aldehyde group may be produced at C_1 of glucose unit, hence it is also a reducing sugar.



β -D-Galactose

β -D-Glucose

Structure of Lactose

THANKS

for

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