

Topic: Carbohydrates; Structure

B.Sc. Botany Hons. III

Paper: VI Group: A

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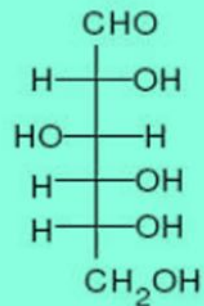
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Sugars with five and six carbons can readily cyclize and when they do, a new asymmetric carbon is created that didn't exist in the same sugars when they were in the straight chain form. This carbon has a special name - it is called the anomeric carbon and (like the other asymmetric carbons in sugars) it can have the hydroxyl in two different positions. These positions are referred to as α and β .

Sugars, such as α -D-glucose and β -D-glucose that differ only in the configuration of the anomeric carbon are referred to as anomers.



Conversion of glucose from a straight chain form to a ring form

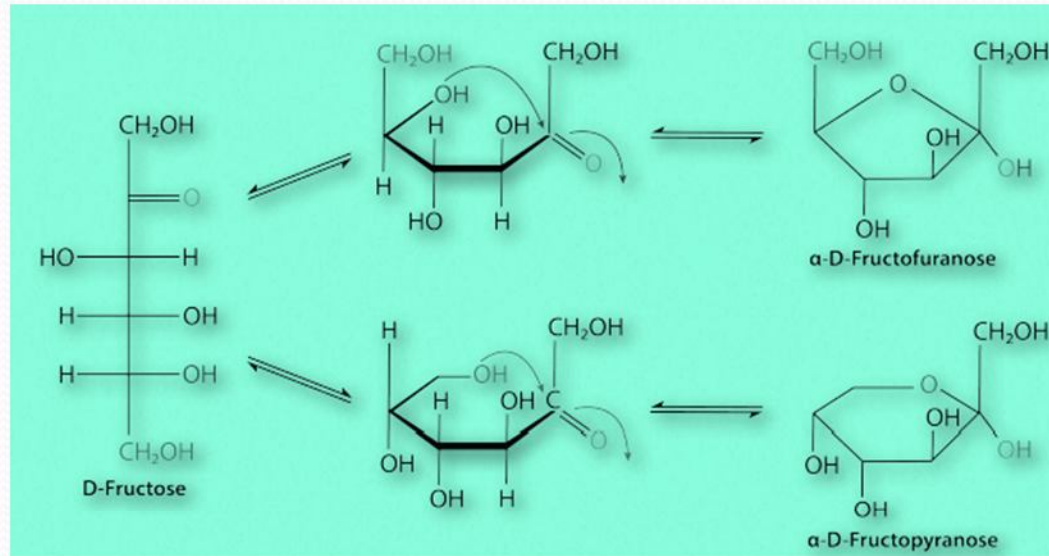


Fig. Conversion of D-fructose between furanose (top right), linear (left), and pyranose (bottom right)

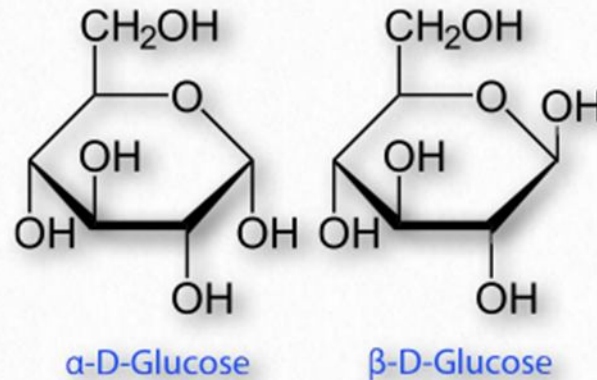



Fig. Anomers - α -D-Glucose and β -D-Glucose differ only in the configuration of the anomeric carbon #1



Sugars cyclizing to form rings with five atoms in them are referred to as furanoses (named for furan) and those forming rings with six atoms, such as glucose in the same figure, are called pyranoses (named for pyran).

The carbonyl carbon becomes the anomeric carbon in the ring by binding to the oxygen of a hydroxyl elsewhere in the chain. α - and β - forms of a given sugar can readily “flip” between each form in solution, so long as the anomeric hydroxyl is free. Most pentoses and hexoses can form both furanose and pyranose structures.

Linking the anomeric hydroxyl to another group will create a glycoside and glycosides will remain locked in whichever α - or β - configuration they were in when the anomeric hydroxyl was altered.

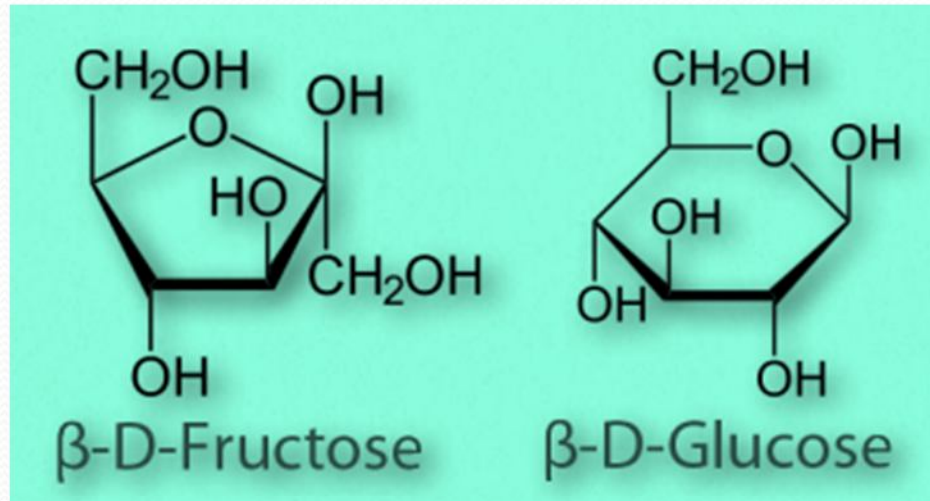


Figure 2.154 - A furanose (left) and a pyranose (right)