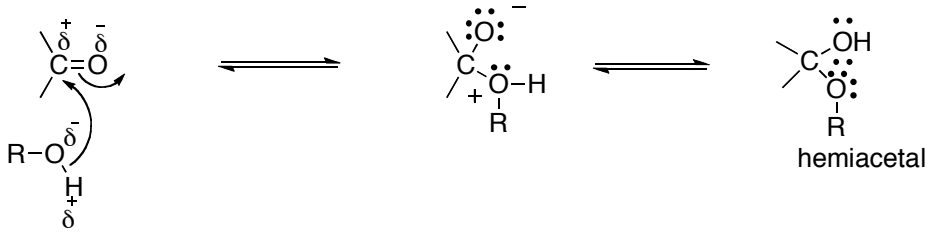
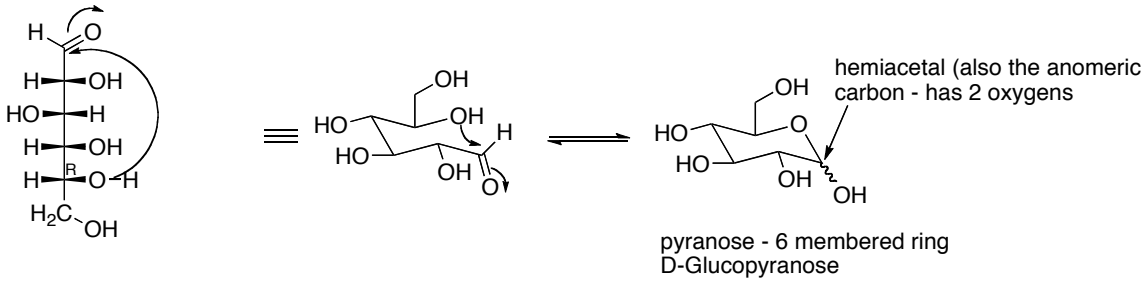
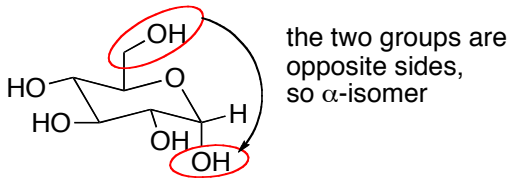
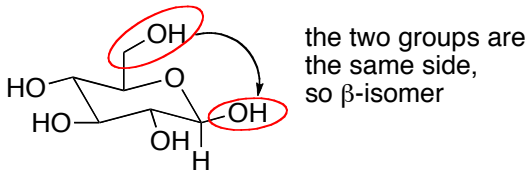
Hemiacetal formation:







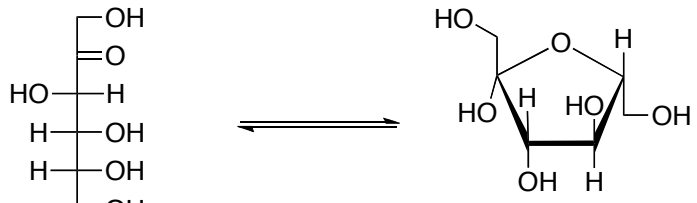
α-D-glucopyranose



β-D-glucopyranose

* in the above case, the hemiacetal formation could give both isomers (α and β), depending on which face of the carbonyl is attacked. Usually α favoured (anomeric effect)

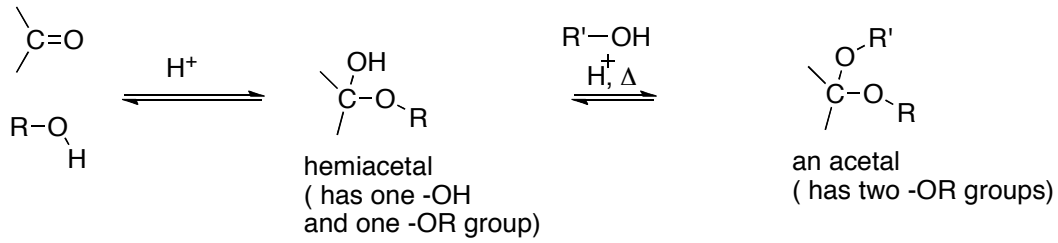
❖ Closed and opened structures of D-glucose are structural isomers while two closed structures are diastereomers.



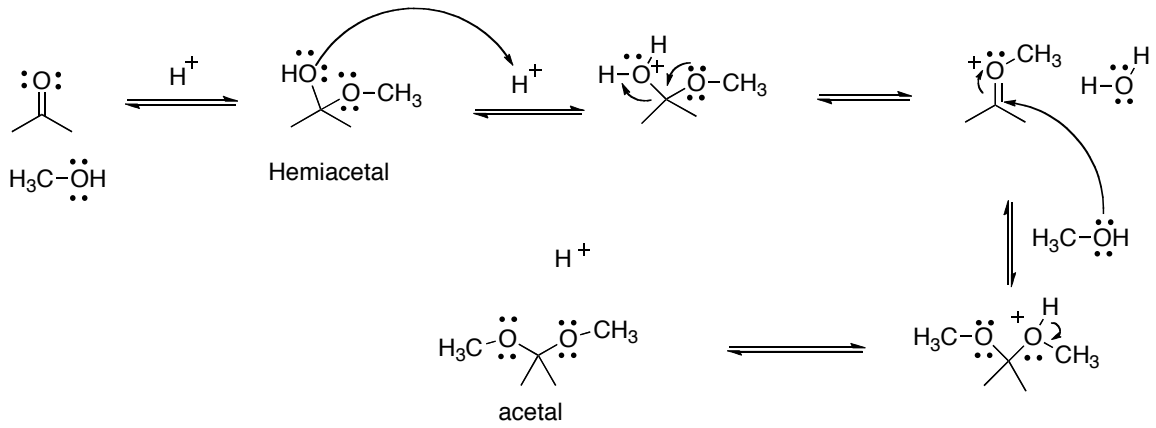
β-D-fructofuranose

furanose = 5 membered ring

Acetal formation:

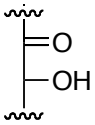


Mechanism of acetal formation:

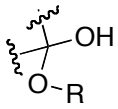


Reducing sugars:

aldehyde



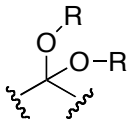
a hydroxy ketone



hemiacetal

Non-reducing sugars

- all other sugars

- acetal 

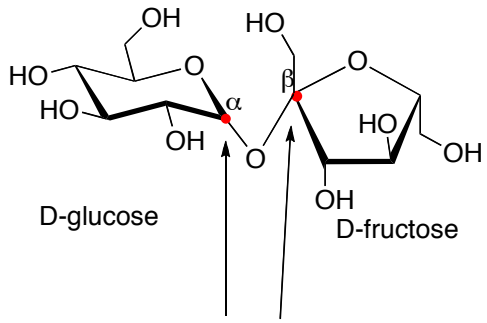
Eg.

Polysaccharides

- Classifications of sugars based on the number of monomers:

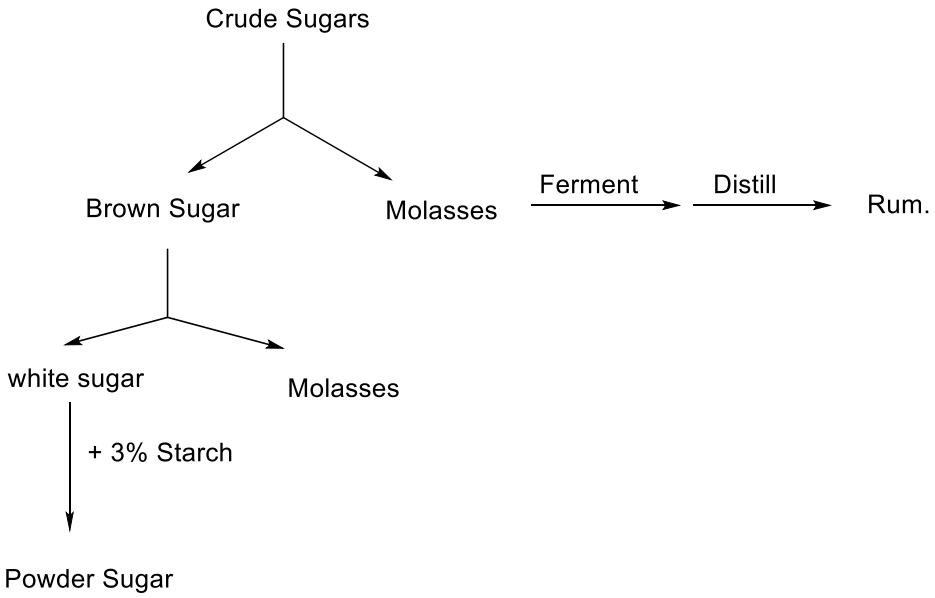
1. Disaccharides : 2 sugars linked
2. Trisaccharides: 3 sugars linked
3. Tetrasaccharides: 4 sugars linked
4. Oligosaccharides: Oligo meaning a few
5. Polysaccharides: Poly means many

-Sucrose – disaccharides (glucose + fructose)



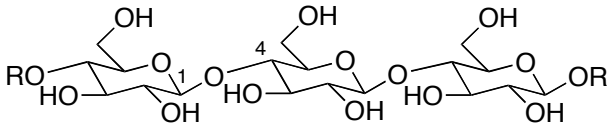
Non-reducing (acetals)

β-D-fructofuranosyl-α-D-glucopyranoside



Sugar polymers:

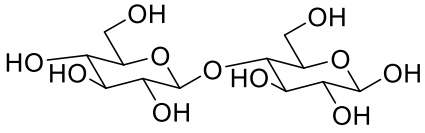
- Cellulose (cotton, paper)



Cellulose (β-1,4-linkages)

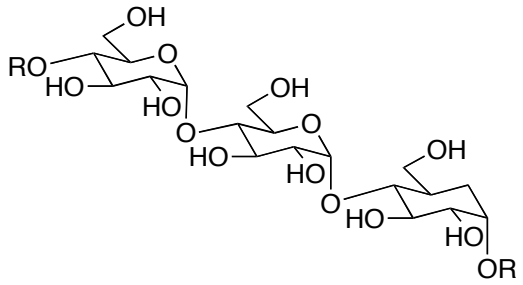
Contains acetals (non-reducing sugars)

- Cellobiose, a disaccharide of glucose, with the same β-1,4- linkage;



Cellobiose

- Starch (20% amylose and 80% amylopectin)



Amylose (1000 units) above, contains a linear chain of Glucose with α-1,4 linkages

- Maltose, a disaccharide of glucose, with the same α-1,4 linkage;