Structures of Monosaccharides Fischer Projections

A Fischer projection

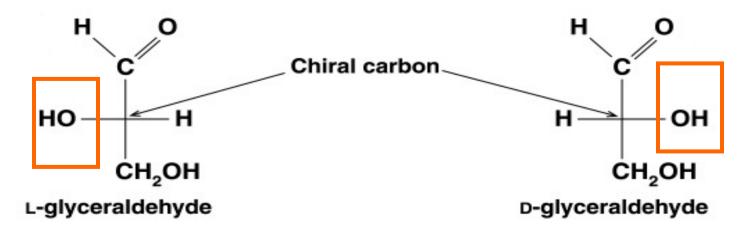
- Is used to represent carbohydrates.
- Places the most oxidized group at the top.
- Shows chiral carbons as the intersection of vertical and horizontal lines.

Fischer projections of glyceraldehyde

D and L Rotations

In a Fischer projection, the -OH group on the

- Chiral carbon farthest from the carbonyl group determines an L or D isomer.
- Left is assigned the letter L for the L-isomer.
- Right is assigned the letter D for the D-isomer.
- Four chiral centers,2 n=2 4 = 16 stereoisomers



Enantiomers and epimers

these two aldotetroses are enantiomers. They are stereoisomers that are mirror images of each other

these two aldohexoses are C-4 epimers. they differ only in the position of the hydroxyl group on one asymmetric carbo (carbon 4)

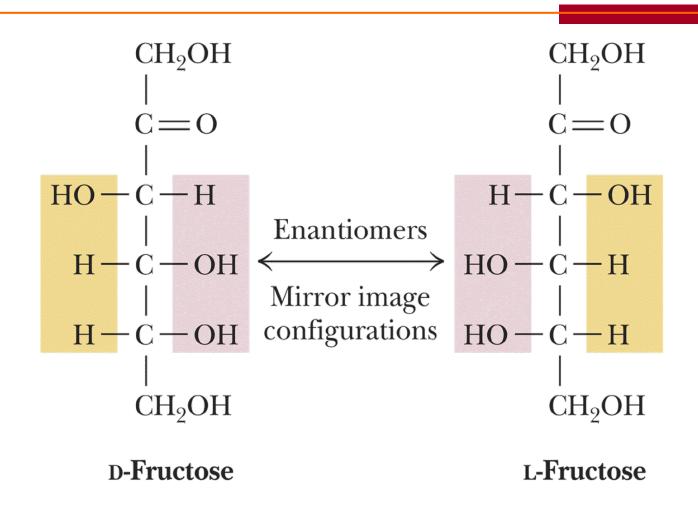
Enantiomers

- Pairs of stereoisomers
- Designated by D- or L- at the start of the name.

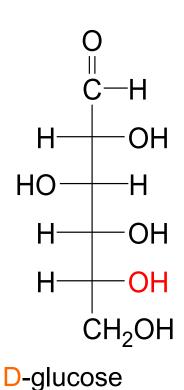
They are mirror images

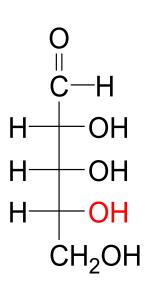
that can't be overlapped.



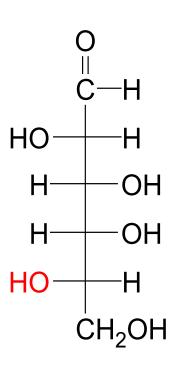


Examples of D and L Isomers of Monosaccharides





D-ribose



L-galactose

Epimers – stereoisomers that differ only in configuration about <u>one</u> chiral center.

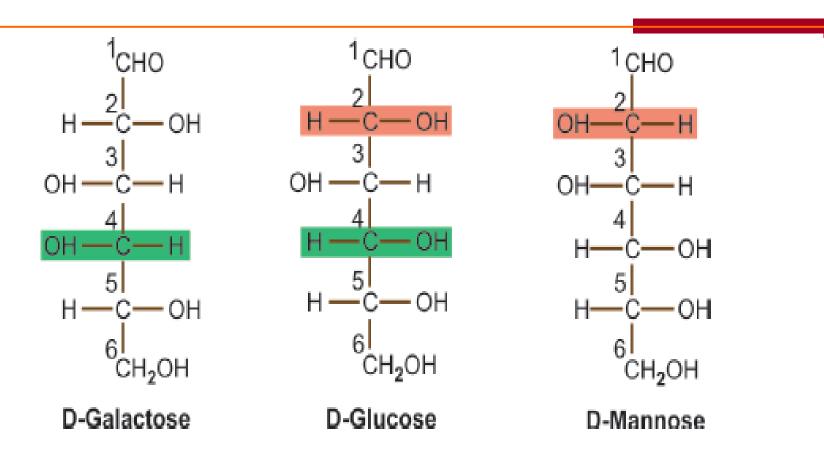
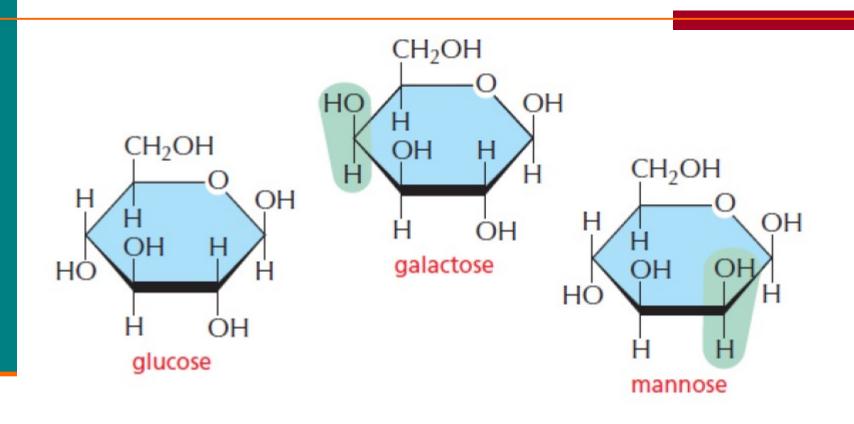


Figure 2.4: Epimers of glucose

Epimers – stereoisomers that differ only in configuration about <u>one</u> chiral center.

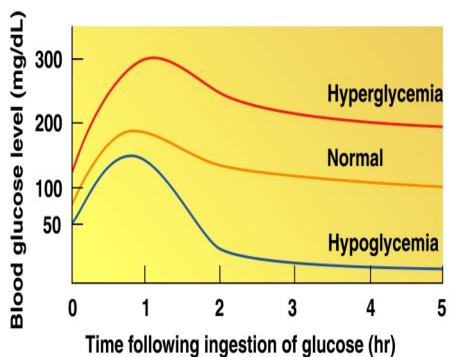


D-Glucose



D-glucose is

- Found in fruits, corn syrup, and honey.
- An aldohexose with the formula C₆H₁₂O₆.
- Known as blood sugar in the body.
- The monosaccharide in polymers of starch, cellulose, and glycogen.
- In the body,
- Blood Glucose Level:
- Glucose has a normal blood level of 70-100 mg/dL.
- A glucose tolerance test measures blood glucose for several hours after ingesting glucose.



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D-fructose

- Is a ketohexose C₆H₁₂O₆.
- Is the sweetest carbohydrate.
- Is found in fruit juices and honey.
- Converts to glucose in the body.

D-galactose is

- An aldohexose C₆H₁₂O₆.
- Not found free in nature.
- Obtained from lactose, a disaccharide.
- A similar structure to glucose except for the
 OH on C4.

$$\begin{array}{c} \mathsf{O} \\ \mathsf{C} \\ \mathsf{C} \\ \mathsf{H} \\ \mathsf{C} \\ \mathsf{C} \\ \mathsf{O} \\ \mathsf{H} \\ \mathsf{H} \\ \mathsf{C} \\ \mathsf{C} \\ \mathsf{C} \\ \mathsf{H} \\ \mathsf{H} \\ \mathsf{C} \\ \mathsf{C} \\ \mathsf{C} \\ \mathsf{H}_2 \\ \mathsf{O} \\ \mathsf{H} \\ \mathsf{C} \\ \mathsf{C} \\ \mathsf{H}_2 \\ \mathsf{O} \\ \mathsf{H} \\ \mathsf{C} \\ \mathsf{C} \\ \mathsf{H}_2 \\ \mathsf{O} \\ \mathsf{H} \\ \mathsf{C} \\ \mathsf{C} \\ \mathsf{C} \\ \mathsf{H}_2 \\ \mathsf{C} \\ \mathsf$$

 ${\rm CH_2OH} \\ {\rm C=O} \\ {\rm HO-C-H} \\ {\rm H-C-OH} \\ {\rm H-C-OH} \\ {\rm CH_2OH} \\ {\rm CH_$

D-Fructose

D-Galactose

Straight chain structure of D-glucose (Fisher projection formula)

$$CH_2OH$$
 $C=O$
 $C=O$
 CH_2OH
 CH_2OH
 CH_2OH
 CH_2OH
 CH_2OH
 CH_2OH
 CH_2OH
 CH_2OH
 CH_2OH
 CH_2OH