D-Aldose sugars

CHM 333
Spring 2002

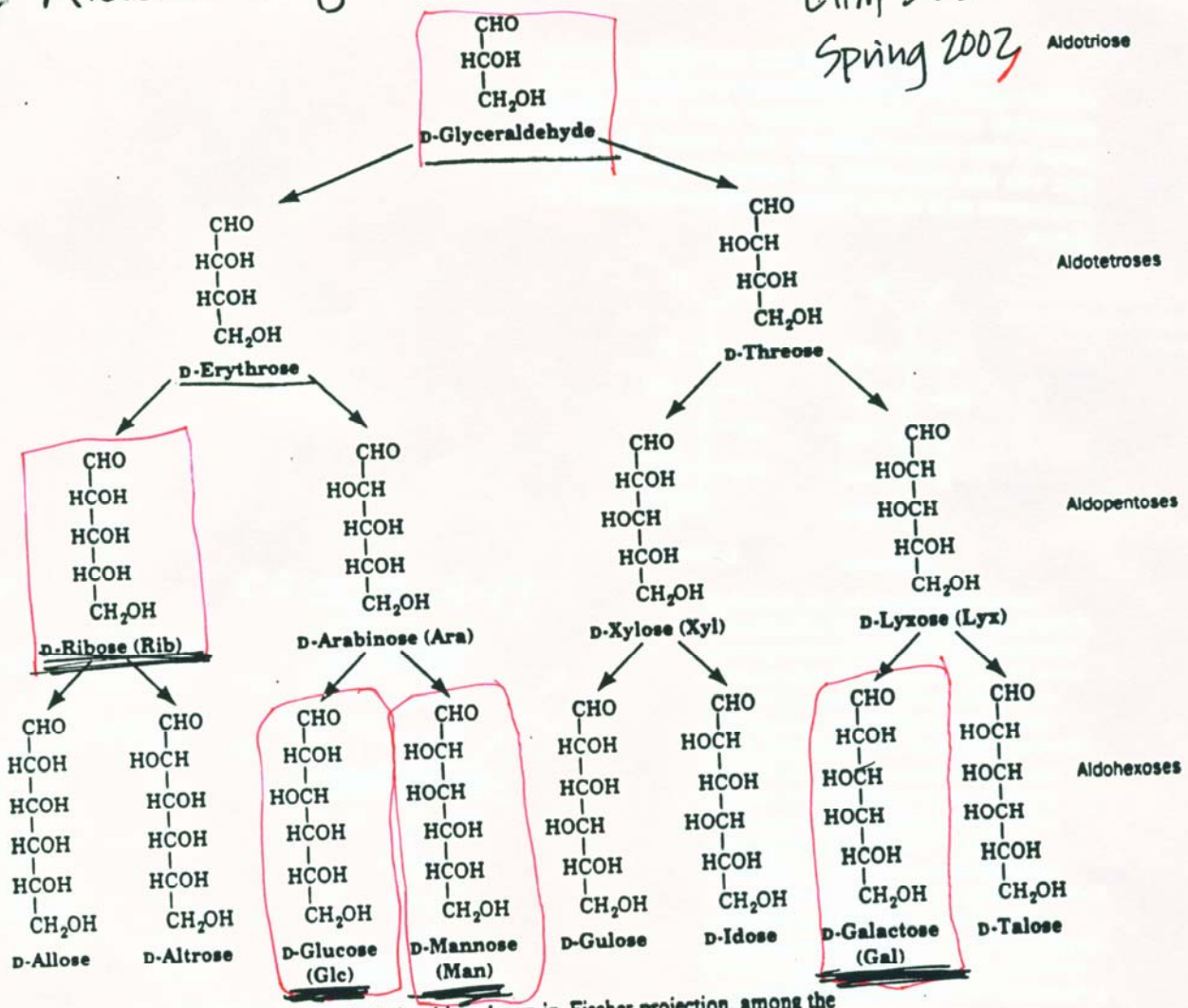


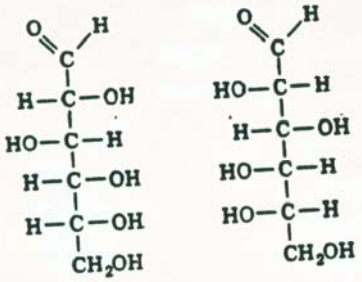
FIGURE 10-1. The stereochemical relationships, shown in Fischer projection, among the D-aldoses with three to six carbon atoms. The configuration about C2 (*red*) distinguishes the members of each pair.

Fischer projections of

Need to know underlined sugars

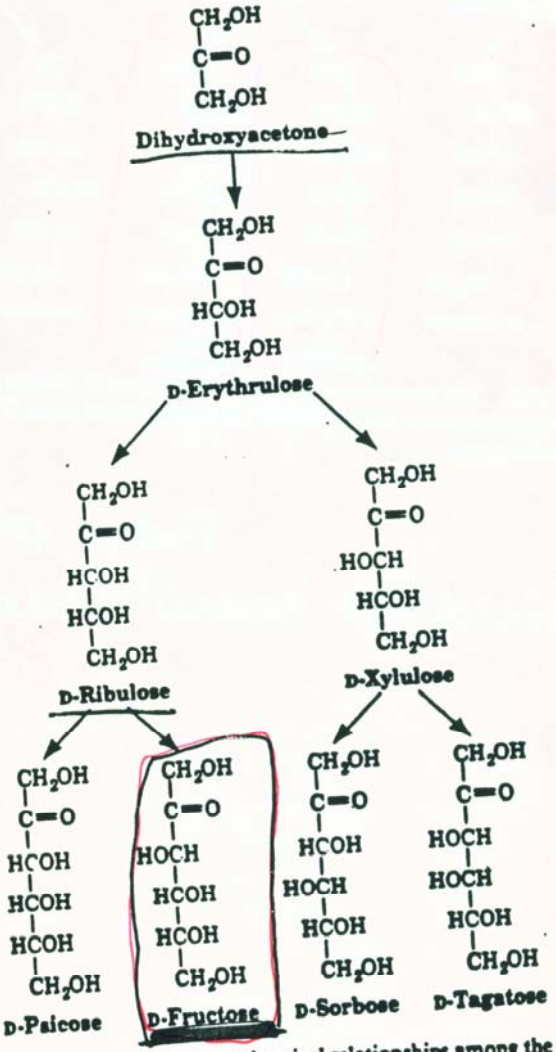
(circled).

According to the Fischer convention (Section 4-2B), *D sugars have the same absolute configuration at the asymmetric center farthest removed from their carbonyl group as does D-glyceraldehyde.* The L sugars, in accordance with this convention, are mirror images of their D counterparts as is shown below in Fischer projection for glucose.



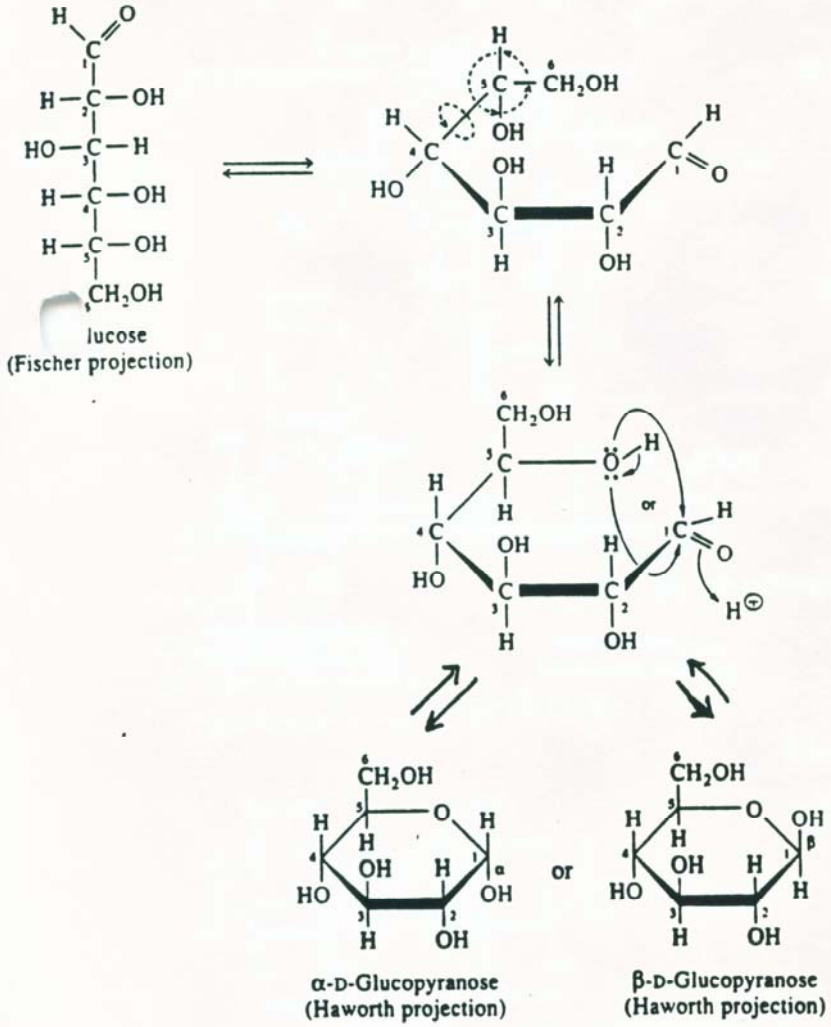
D-Glucose L-Glucose

D-ketoses



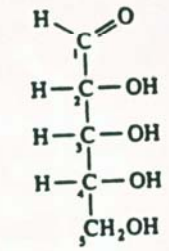
know fructose

FIGURE 10-2. The stereochemical relationships among the D-ketoses with three to six carbon atoms. The configuration about C3 (*red*) distinguishes the members of each pair.

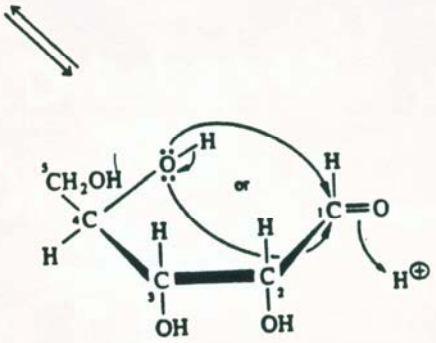


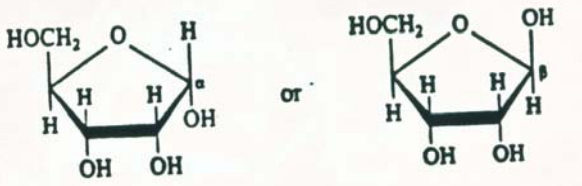
Cyclization of D-glucose to form glucopyranose. The Fischer projection (top left) is rearranged into a three-dimensional representation (top right). Rotation of the bond between C-4 and C-5 brings the C-5 hydroxyl group close to the C-1 aldehyde group. Reaction of the hydroxyl group with one side of C-1 gives α-D-glucopyranose; reaction of the hydroxyl group with the other side gives β-D-glucopyranose. The glucopyranpse products are shown as Haworth projections, in which the lower edges of the ring (thick lines) project in front of the plane of the paper and the upper edges project behind the plane of the paper. In the α-D anomer of glucose, the hydroxyl group at C-1 points down; in the β-D anomer, it points up.

Cyclization of D-ribose to form α- and β-D-ribofuranose.



D-Ribose
(Fischer projection)

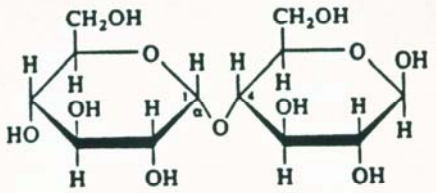




α-D-Ribofuranose
(Haworth projection)

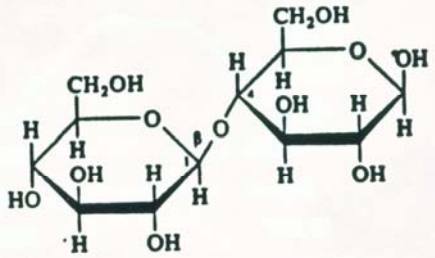
β-D-Ribofuranose
(Haworth projection)

(a)



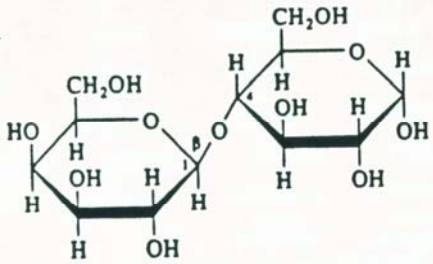
β anomer of maltose
(α-D-Glucopyranosyl-(1→4)-β-D-glucopyranose)

(b)



β anomer of cellobiose
(β-D-Glucopyranosyl-(1→4)-β-D-glucopyranose)

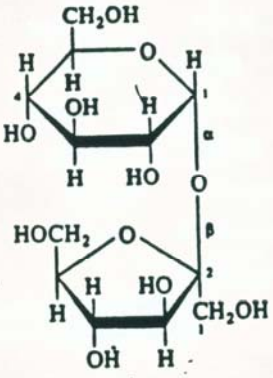
(c)



α anomer of lactose
(β-D-Galactopyranosyl-(1→4)-α-D-glucopyranose)

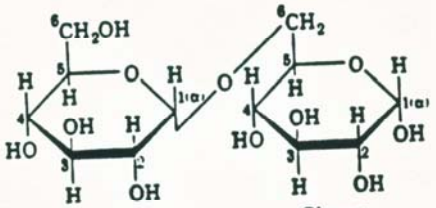
refers to orientation of anomeric carbon in linkage

(d)



Sucrose
(α-D-Glucopyranosyl-(1→2)-β-D-fructofuranoside)

two monosaccharides joined together



Glucose Glucose

Isomaltose (α-anomer)