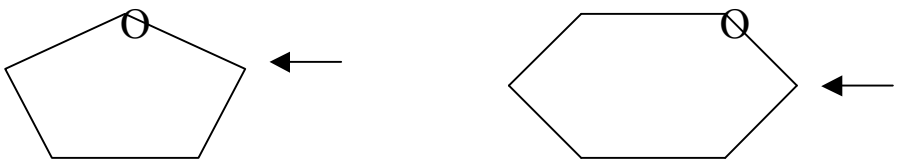
HAWORTH PROJECTIONS

By Frank Deis

Students seem to have particular problems in drawing the Haworth projections of Keto sugars. This review is designed to address that topic. First, remember that FURAN or FURANOSE means a FIVE membered ring. The easy way to recall this is that the word Furan and the word Five both start with the same letter, F. Second, PYRAN or PYRANOSE means a SIX membered ring. If you are slightly dyslexic you might conceivably confuse the letter P with the number 6.

FURAN PYRAN



The right hand corner of the pentagon or hexagon (see arrows above) is the anomeric carbon. You have to remember that for a keto sugar this is CARBON TWO, which means that it must have two substituents, a hydroxyl and "CARBON ONE" which has the form CH_2OH. For D sugars, the alpha designates a "down" hydroxyl (implying an "up" CH_2OH) and the beta designates an "up" hydroxyl (meaning that CH_2OH goes down).

It will help to remember that the anomeric carbon, in the Fischer projection, has two bonds to oxygen in the form of a carbonyl group (C=O). Thus the anomeric carbon continues to have two bonds to oxygen after formation of the cyclic ring form, but now they are different oxygens.

The converse of this is that NO OTHER CARBON than the anomeric carbon has two bonds to oxygen. Be sure that the other ring juncture carbon (often 4 or 5 in aldehydes, or 5 or 6 in ketones) does NOT have an extra hydroxyl. The ring oxygen is its only oxygen.

For practice draw α-D-fructopyranose, β-D-sedoheptulofuranose, and α-D-xylulo-furanose.