Conversion of Fischer Structure of Monosaccharides to Haworth Structure

How can Fischer representations of pentoses and hexoses be easily converted to Haworth structures?

Haworth structures more closely depict proper bond angles and lengths than do Fischer representations. To convert from the traditional Fischer formula of a D-pentose or D-hexose in a Haworth formula, the following steps should be followed:

1. Draw a five- or six-membered ring with the oxygen placed as shown below:

Five-membered ring   Six-membered ring

2. Starting with the anomeric carbon to the right of the ring oxygen, place hydroxyl groups either above or below the plane of the ring. Groups that are pointing to the left in the Fischer projection formula should go above the plane of the ring, and those that are pointing to the right in the Fischer projection formula should go below the ring.

3. In D-sugars, the last carbon position (e.g., C-6 glucose) is always up.
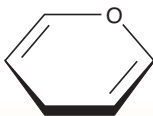
SUMMARY: Three steps allow the conversion of Fischer structures to Haworth structures.