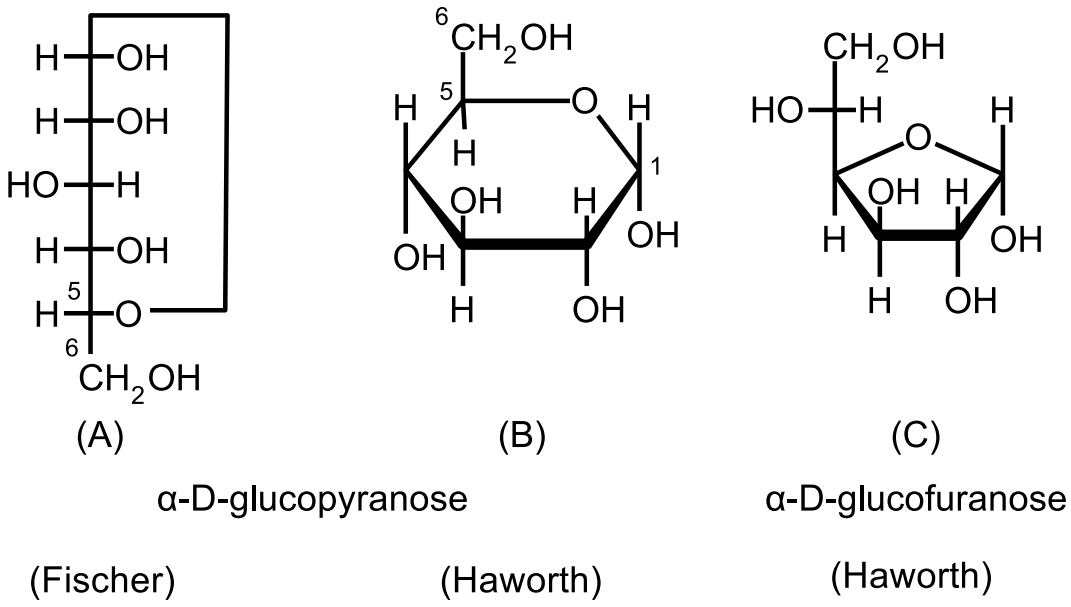
doi:10.1351/goldbook.H02749

Haworth representation

The Haworth representation of the cyclic forms of monosaccharides can be derived from the Fischer projection, as follows. The monosaccharide is depicted with the carbon-chain horizontal and in the plane of the paper, the potential carbonyl group being to the right. The oxygen bridge is then depicted as being formed behind the plane of the paper. The heterocyclic ring is therefore located in a plane approximately perpendicular to the plane of the paper and the groups attached to the carbon atoms of that ring are above and below the ring. The carbon atoms of the ring are not shown. Groups that appear to the right of the vertical chain in the Fischer projection (structures A, D) then appear below the plane of the ring in the Haworth representation (structures B, C, E). However, at the asymmetric carbon atom (C-5 in A; C-4 in D) involved via oxygen in ring formation with the carbon atom of the carbonyl group a formal double inversion must be envisaged to obtain the correct Haworth representation. In the pyranose forms of D-aldohexoses C-6 will always be above the plane, In the furanose forms of D-aldohexoses the position of C-6 will depend on the configuration at C-4; it will, for example, be above the plane in D-glucofuranoses (e.g. C) but below the plane in D-galactofuranoses (e.g. E).



(A) (B) (C)

α-D-glucopyranose α-D-glucofuranose

(Fischer) (Haworth) (Haworth)

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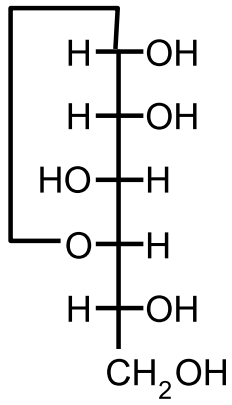
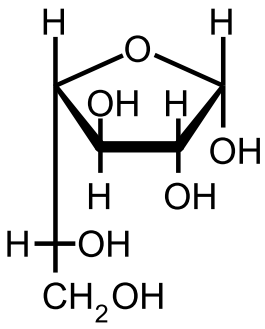
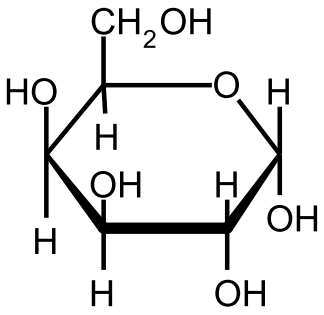


(D)



(E)



(F)

α-D-galactofuranose

(Fischer) (Haworth)

α-D-galactopyranose

(Haworth)

Source:
White Book, p. 128

