Fructose is more commonly found together with glucose and sucrose in honey and fruit juices. Fructose, along with glucose are the monosaccharides found in disaccharide, sucrose. Fructose is classified as a monosaccharide, the most important ketose sugar, a hexose, and is a reducing sugar.

**Introduction**

An older common name for fructose is levulose, after its levorotatory property of rotating plane polarized light to the left (in contrast to glucose which is dextrorotatory). Bees gather nectar from flowers which contains sucrose. They then use an enzyme to hydrolyze or break apart the sucrose into its component parts of glucose and fructose. High Fructose Corn Syrup

![Fructose Molecule Diagram](Image)

**Ring Structure for Fructose**

The chair form of fructose follows a similar pattern as that for glucose with a few exceptions. Since fructose has a ketone functional group, the ring closure occurs at carbon #2. In the case of fructose a five membered ring is formed. The -OH on carbon #5 is converted into the ether linkage to close the ring with carbon #2. This makes a 5 member ring - four carbons and one oxygen.
Steps in the ring closure (hemiketal synthesis)

1. The electrons on the alcohol oxygen are used to bond the carbon #2 to make an ether (red oxygen atom).
2. The hydrogen (green) is transferred to the carbonyl oxygen (green) to make a new alcohol group (green).

The ring structure is written with the orientation depicted on the left for the monosaccharide and is consistent with the way the glucose is depicted.

Hemiketal Functional Group

The anomeric carbon is the center of a hemiketal functional group. A carbon that has both an ether oxygen and an alcohol group (and is attached to two other carbons is a hemiketal.

Compare Alpha and Beta Fructose

The Beta position is defined as the -OH being on the same side of the ring as the C # 6. In the ring structure this results in a upwards projection for the -OH on carbon # 2. The Alpha position is defined as the -OH being on the opposite side of the ring as the C # 6. In the ring structure this results in a downward projection for the -OH on carbon # 2. The alpha and beta label is not applied to any other carbon - only the anomeric carbon, in this case # 2.
Compare Glucose and Fructose in the Chair Structures

The six member ring and the position of the -OH group on the carbon (#4) identifies glucose from the -OH on C # 4 in a down projection in the Haworth structure. Fructose is recognized by having a five member ring and having six carbons, a hexose. Both glucose and fructose may be either alpha or beta on the anomeric carbon, so this is not distinctive between them.

Problems

Which carbon in the structure on the in Figure 2 is the anomeric carbon?

Contributors

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