Carbohydrates:

carbohydrates (symbol is **CHO**) are the most abundant organic compounds found in in natural sources. They consist of carbon, hydrogen and oxygen. They constitute a large proportion of the plant mass and are responsible. sugars unite with a wide variety of other compounds are used to form glycosides, Mucilages and others.

Importance of carbohydrates:

1-serve as a source of energy and storage for energy like starch and glycogen.

2-they are structural compounds for many plants and animals like cellulose

3-play a role of synthesis of nucleic acid like DNA and RNA

4-they found as a component of natural product like **blood groups** and **cartilages**

There are many types of glucose:

1-Simple carbohydrates (monosaccharide's): (glucose $C_6H_{12}O_6$, fructose and galactose)

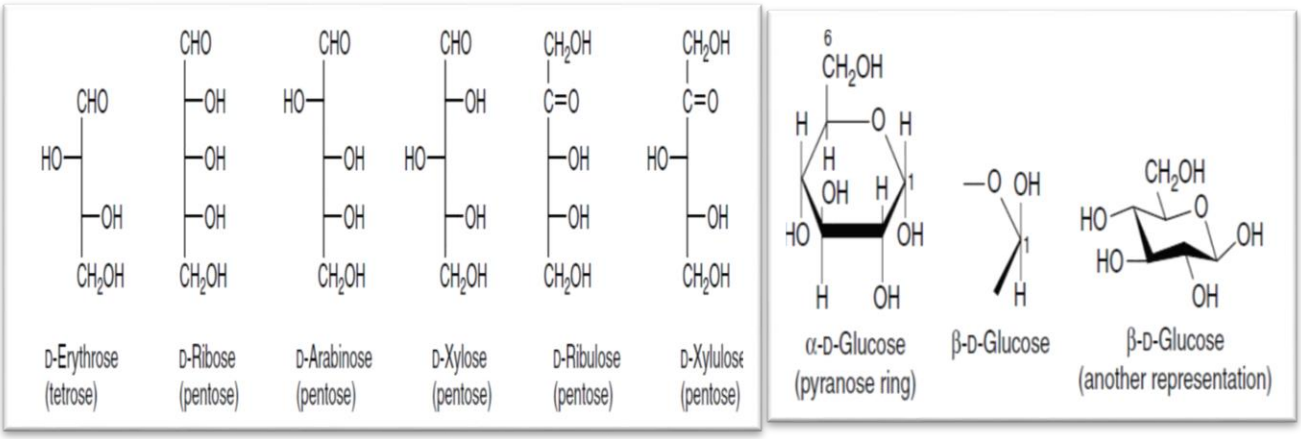
2-oligosaccharide :

A-disaccharide: Maltos [glucose+ glucose], lactose [glucose+ galactose] and sucrose $C_{12}H_{22}O_{12}$ [glucose +fructose].

B-polysaccarides : starch (from plants sources) and glycogen (animals)

Both monosaccharide's and disaccharide have the characteristic of use the suffix(ose) eg. Gluc**ose**,galact**ose**. Those carbohydrates with (3,4,5,6,7) are called (tri**ose**, tetr**ose**, pent**ose**, hex**ose**, hept**ose**, respectively. The formula of sugars are written in no of different ways:

a-Fischer projection: straight chain formula b-Hawarth projection : ring formulas



note: Hawarth project is better than Fischer due to the Hawarth gives the actual configuration of the compound **<u>that</u>** found in nature while the first one used for the easy of the easy of study theoretically.

Carbohydrate's may contain an aldehyde group and is therefore called an aldose sugar; or a ketone group and therefore called a ketose sugar like fructose. The aldose formula is $HOCH_2(CHOH)_n$**CHO** and the ketose formula is $HOCH_2(CHOH)_n$**C=O**

Monosaccarides:

These sugars contain from **<u>three to nine</u>** carbon **atoms**, but those with five and six carbon atoms (pentoses, $C_5H_{10}O_5$, and hexoses, $C_6H_{12}O_6$) are accumulated in plants in greatest quantity.

Free sugars may accumulate as a result of hydrolysis of the glucose-6-phosphate which is converted to sugar nucleotides (e.g. uridine-di-phospho-**glucose**—UDPG) or give rise to other monosaccharide's (e.g. **galactose**)

Di-, tri- and tetrasaccharides

These sugars may also be called bi-**oses**, tri-**oses** and tetr-**oses**. They are **derived** from two, three or four monosaccharide **<u>molecules</u>**.

One of the commonest disaccharides is sucrose; it is formed in photosynthesis by the reaction of glucose with fructose-6- phosphate.

Other disaccharides like maltose, cello-biose, sophorose and trehalose are all composed of two molecules of glucose joined by α-1,4-, β-1,4-, β-1,2- and α,α-1,1-linkages, respectively

Polysaccharides

In polysaccharides the number of sugar units is much larger (from four to larger) . The hydrolysis of polysaccharides, by enzymes or reagents, may produce hexoses or pentoses or their derivatives.

there are number of polysaccharides with pharmacological activities. These include immuno-modulating, antitumour, anti-inflammatory, anticoagulant, hypoglycaemic and antiviral properties. Specific examples are the glycyrrhizans العرقسوس of *Glycyrrhiza uralensis* and *G. glabra* and the glycans of ginseng and *Eleutherococcus* .

questions:

1-define carbohydrates, monosaccharide's, disaccharide's, polysaccharide's, Fischer projection, Hawarth projection

2-true or false: starch responsible for the rigid cellular framework and **cellulose** responsible for providing an important food reserve

3- Importance of carbohydrates?

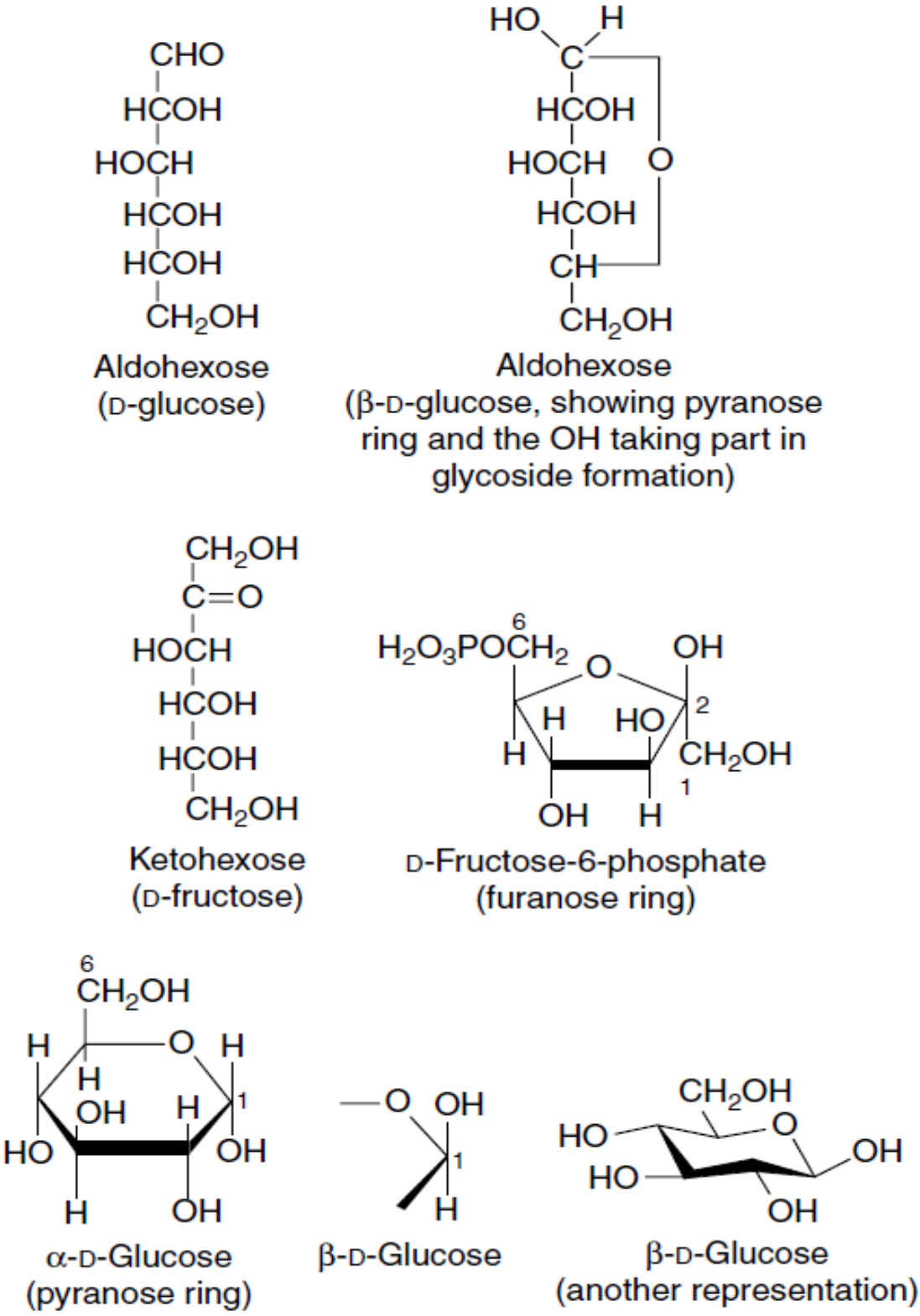


Fig. 20.1
Hexose structures and representation.