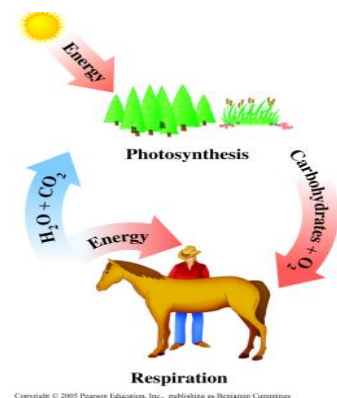




Lecture title: Carbohydrates

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Summary: Carbohydrates are the most abundant **organic** molecules in nature. They are primarily composed of the elements **carbon, hydrogen and oxygen**. The name carbohydrate means '**hydrates of carbon**', they are produced by photosynthesis in the plants. They are major source of energy, and classified based on their carbon chain length. The suffix **ose** indicates that a molecule is a carbohydrate.



Definition:

Carbohydrates, or *saccharides* (*saccharo* is Greek for “sugar”) are polyhydroxy aldehydes or ketones, or substances that yield such compounds on hydrolysis.

The suffix **ose** indicates that a molecule is a carbohydrate .e.g.

Maltose, glucose, lactose, fructose ,ribose



Functions of carbohydrates:

1. They are major source of energy.
2. They function as reserve food material in man and plants.
3. They are components of connective tissues, bone, cartilage, skin, membrane and nerve tissue.
4. They are components of blood group substances, nucleic acids etc.
5. Carbohydrate derivatives are vitamins, antibiotics and drugs.

Classification of Carbohydrates:

Carbohydrates are classified based on their carbon chain length into:-

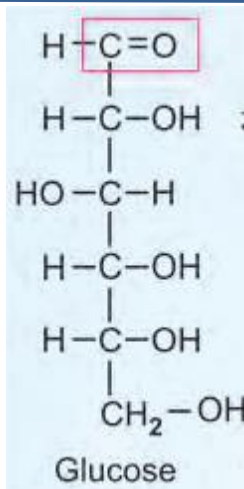
- a. Monosaccharides
- b. Oligosaccharides
- c. Polysaccharides

Monosaccharides (Greek : mono-one) are the simplest group of carbohydrates and are often referred to as **simple sugars**. They have the general formula **$C_n(H_2O)_n$** , and they cannot be further hydrolyzed.

The monosaccharides are divided into different categories:

- a) Based on the functional group b) Based on the number of carbon atoms:

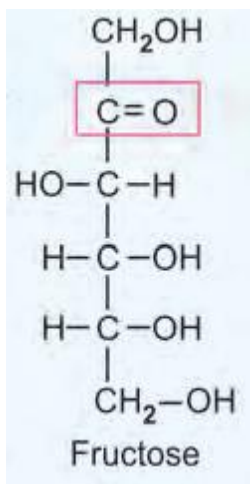
Aldoses : When the functional group in monosaccharides is an **aldehyde $C=O$** group they are known as **aldoses** e.g. **glyceraldehyde, glucose**.



Glucose:-

- Physiologically and biomedically, glucose is the most
- important monosaccharide
- It is called blood sugar
- $C_6H_{12}O_6$
- It is monosaccharide(aldose)
- It is source of energy
- It is produced by hydrolysis of glycogen

Ketoses : When the functional group is a **keto C=O** group, they are referred to as **ketoses** e.g. dihydroxyacetone, fructose.



D-Fructose

D-fructose is a **keto** sugar

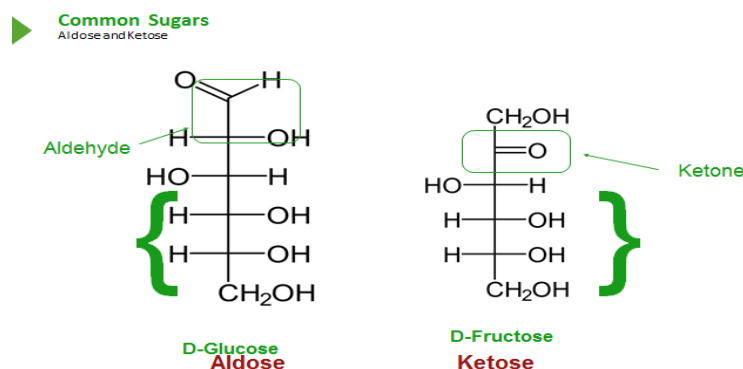
hexose

$C_6H_{12}O_6$

It is the sweetest carbohydrate

It is found in fruit juices and honey

Converts to glucose in the body



Based on the number of carbon atoms, the monosaccharides are regarded as trioses (3C), tetroses (4C), pentoses (5C), hexoses (6C) and heptoses (7C).

These terms along with functional groups are used while naming monosaccharides.

For instance, glucose is an aldohexose while fructose is a ketohexose.

Glucose and fructose are **reducing sugars** because they have **free carbonyl group**.