Lec.3

Macromolecules of the cells

- Carbohydrate
- Proteins
- Lipids
- Nucleic acid

Carbohydrates

Pure carbohydrates have the formula (CH2O)n. n is the number of carbons in the molecule the ratio of carbon to hydrogen to oxygen is 1:2:1 Carbohydrates are classified into three **subtypes**:

monosaccharides,

disaccharides,

polysaccharides

Monosaccharides

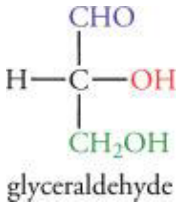
1. Monosaccharides (mono- = “one”; sacchar- = “sweet”) are simple sugars

2. the number of carbons usually ranges from three to seven.

3. Most monosaccharide names end with the suffix -ose

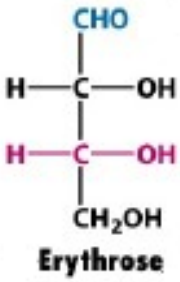
Depending on the number of carbons in the sugar:

Triose (three carbons) like **glyceraldehyde**



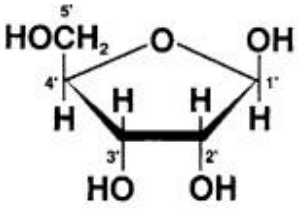
glyceraldehyde

Tetrose (four carbons) like erythrose.

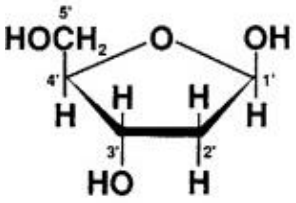


Erythrose

Pentose (five carbons) such as ribose and deoxyribose



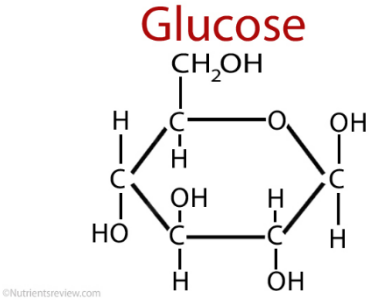
β-D-ribose



β-D-2-Deoxyribose

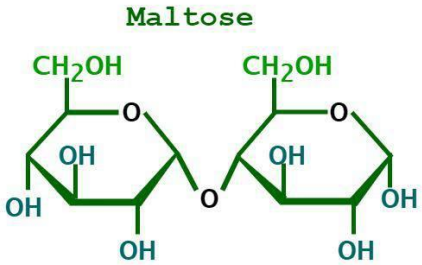
Hexose (six carbons) like glucose

used as a basic source of energy by most heterotrophic cells



Disaccharides

Disaccharides (di = "two") form when two monosaccharides connected by a glycosidic bond.



Lactose consisting of glucose and galactose.

Maltose (malt sugar), is formed of two glucose molecules.

Sucrose (table sugar), is composed of glucose and fructose

Polysaccharides

- polysaccharide (poly- = “many”)
- A long chain of monosaccharides linked by glycosidic bonds
- The chain may be branched or unbranched
- it may contain different types of monosaccharides
- The molecular weight may be 100,000 daltons or more depending on the number of monomers joined.
- Starch, glycogen, cellulose, and chitin are primary examples of polysaccharides.

Starch is the stored form of sugars in plants and is made up of a mixture of amylose and amylopectin.

Glycogen is the storage form of glucose in humans and other vertebrates and is made up of monomers of glucose.

Glycogen is the animal equivalent of starch and is a highly branched molecule usually stored in liver and muscle cells.

Cellulose is made up of glucose monomers that are linked by β 1-4 glycosidic bonds

Functions of Carbohydrates:

1-Living organisms use carbohydrates as a source of energy.

2-Serve as energy stores, fuels. It is stored as glycogen in animals and starch in plants.

3-They form structural and protective components, like (cellulose) in the cell wall of plants and (structural elements in the cell membrane of animals).

4-Carbohydrates are intermediates in the biosynthesis of fats and proteins.

5-Formation of the structural framework of RNA and DNA.