

Carbohydrate (saccharide)

A simple sugar (monosaccharide) or many simple sugars linked together

- Carbohydrates are usually made by photosynthesis and are usually used as a fuel for cells.
- Some common things made of carbohydrates:

- √ Sugars

- √ Starchy foods (bread, pasta, potatoes, etc.)

- √ Inedible materials from plants (cotton, paper, wood)

Monosaccharide (simple sugar)

A small organic molecule with the general formula $C_nH_{2n}O_n$

- Most simple sugar names end in “-ose”

Examples: Glucose, fructose, galactose, ribose

- Most monosaccharides are ring shaped molecules
- Monosaccharide molecules have many OH functional groups

✓ The polar OH groups make them hydrophilic

- Glucose ($C_6H_{12}O_6$) is the most abundant organic molecule on earth

✓ Glucose is the main product of photosynthesis

✓ Glucose is our “blood sugar”

✓ Cells use glucose as their main energy source

Fig 5.5

Disaccharide

Two monosaccharides joined together

- Maltose = glucose + glucose
- Sucrose (table sugar) = glucose + fructose
- Lactose (milk sugar) = glucose + galactose

Fig 5.5

Polysaccharides (complex carbohydrates)

A large number of glucose molecules linked together

- Starch and cellulose are the two major plant polysaccharides

Starch

A plant polysaccharide that is used to store glucose for energy

- All glucose molecules in starch are in the same orientation
- Abundant in wheat, oats, rice, corn, and potatoes
- Animals make a similar energy-storage polysaccharide called glycogen

√ Glycogen is most abundant in liver and muscles

√ The glycogen molecule is more branched than starch

Figs 5.6 and 5.7

Cellulose

A plant polysaccharide that is used as a structural substance (a strong building material) in plants

- Every other glucose molecule is upside down
- Cellulose is abundant in plant cell walls; It is the building material of leaves, stems, roots, and wood

√ Inedible plant products (lumber, paper, cotton, etc.) are mostly cellulose

- Animals can't digest cellulose
- Insects and shellfish make their exoskeletons (shells) from a cellulose-like polysaccharide called chitin

√ Glucoseamine is the monomer of chitin

Figs 5.7, 5.8, 5.9, and 5.10