The Chemistry of Carbon

Organic chemistry is the study of all compounds that contain bonds between carbon atoms.

Carbon atoms have four valence electrons that can join with the electrons from other atoms to form strong covalent bonds.

A carbon atom can bond to other carbon atoms, giving it the ability to form chains that are almost unlimited in length.

Living organisms are made of molecules that consist of carbon and other elements.

Chains of carbon can even close upon themselves to form rings.

Carbon has the ability to form millions of different large and complex structures.

Macromolecules

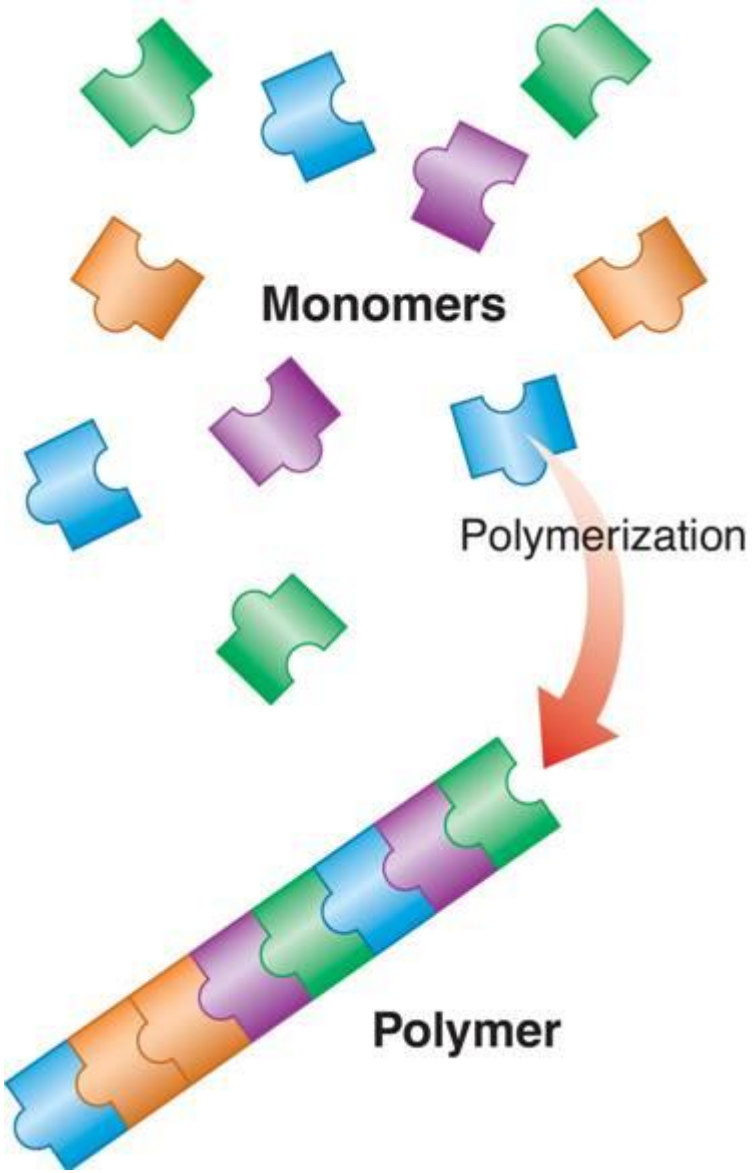
Macromolecules are formed by a process known as polymerization.

The smaller units, or **monomers**, join together to form **polymers**.

Most macromolecules are formed through a process called **dehydration synthesis** (removing H_2O molecules) and broken down by **hydrolysis** (adding H_2O molecules).

*Often involves the help of an enzyme

Monomers in a polymer may be identical, or the monomers may be different.



Four groups of organic compounds found in living things are:

- **carbohydrates**
- **lipids**
- **nucleic acids**
- **proteins**

Carbohydrates

Carbohydrates are compounds made up of carbon, hydrogen, and oxygen atoms, usually in a ratio of 1 : 2 : 1. $C_xH_{2x}O_x$

Ex)

$C_6H_{12}O_6$	$C_5H_{10}O_5$	$C_3H_6O_3$
glucose	ribose	glyceraldehyde

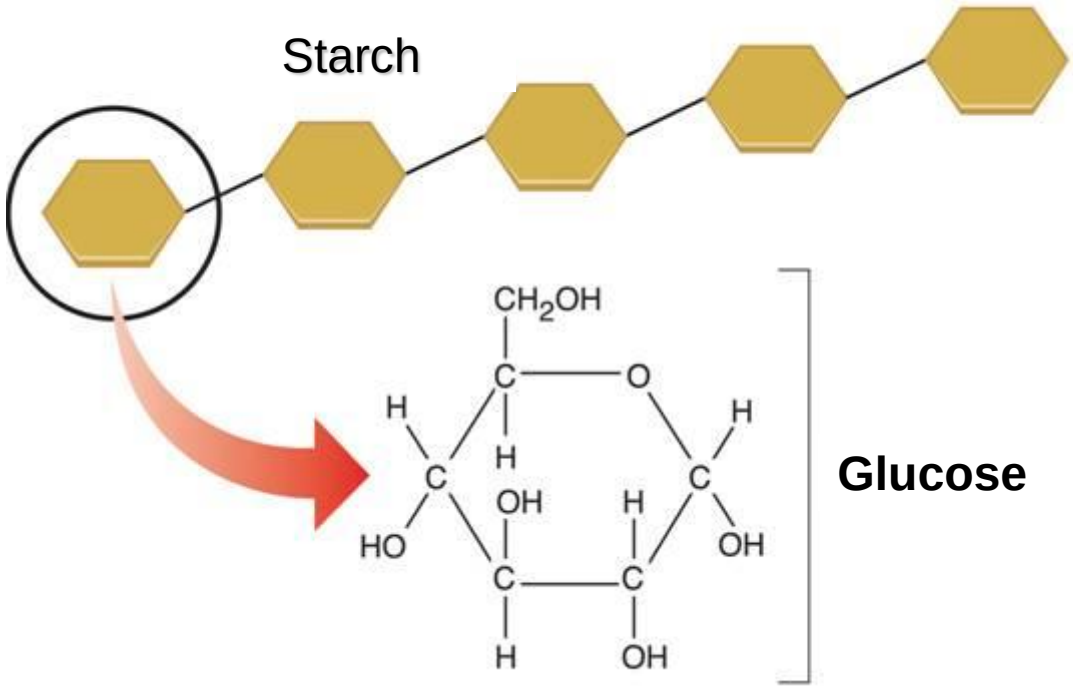
What is the function of carbohydrates?

Living things use carbohydrates as their main source of energy. Plants and some animals also use carbohydrates for structural purposes.

The breakdown of sugars, such as glucose, supplies immediate energy for all cell activities.

Living things store extra sugar as complex carbohydrates known as starches.

Starches and sugars are examples of carbohydrates that are used by living things as a source of energy.



Single sugar molecules are called **monosaccharides**.

Monosaccharides include glucose, galactose (a component of milk), and fructose (found in many fruits).

The large macromolecules formed from monosaccharides are called **polysaccharides**.

1 Large carbohydrate molecules such as starch are known as

a. lipids.

b. monosaccharides.

c. proteins.

d. polysaccharides.

4 Which of the following statements about cellulose is true?

a. Animals make it and use it to store energy.

b. Plants make it and use it to store energy.

c. Animals make it and use it as part of the skeleton.

d. Plants make it and use it to give structural support to cells.