

Unit 3- Lesson 9

Chemistry 0

May 2021, L. Tracey Gao



Class of Organic Molecules

- Hydrocarbons: contain only hydrogen and carbon. They are all very nonpolar, flammable, and similar in both appearance and touch.
 - Alkanes
 - Alkenes
 - Alkynes
 - Aromatics



Alcohols and Amines

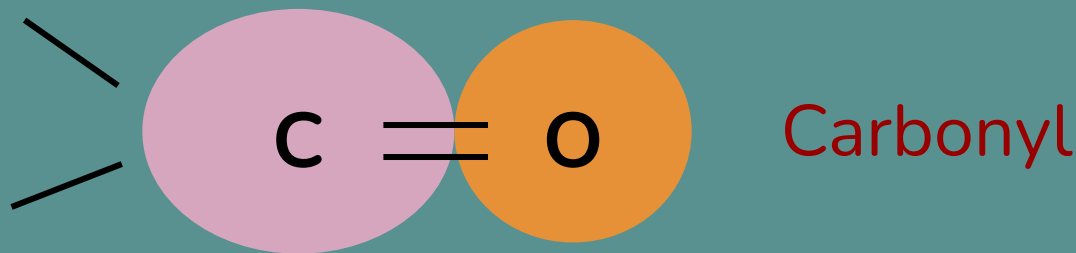
- An **alcohol** is any molecule with a -OH group attached to a carbon atom.
- An **amine** is any molecule with a -NH₂ group attached to a carbon atom.
- Both the -OH group and -NH₂ group are very polar, so alcohols and amines are usually polar. They tend to dissolve well in water, and the liquid alcohol, especially, can act as solvents for other polar molecules.

Some simple alcohols and amines

Name	Structure	Uses
Methanol	CH_3OH	Methyl alcohol
Ethanol	$\text{CH}_3\text{CH}_2\text{OH}$	Ethyl alcohol- “alcohol” in wine, beer, etc.
1-propanol	$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	Used as a solvent
2-propanol	$\begin{array}{c} \text{OH} \\ \\ \text{CH}_3\text{CHCH}_2\text{OH} \end{array}$	Isopropyl alcohol- “rubbing alcohol”
Methylamine	CH_3NH_2	Used in producing agricultural chemicals
Ethylamine	$\text{CH}_3\text{CH}_2\text{NH}_2$	Used in synthesizing organic molecules

Aldehydes, Acids, and Ketones

- In this group, all the molecules have a characteristic feature called a **carbonyl**, which is a carbon atom that is double bonded to an oxygen.




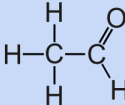
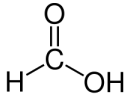
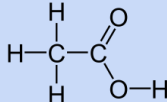
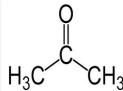
The carbon is double bonded to the oxygen and can form two additional bonds



Aldehydes, Acids, and Ketones

- An **aldehyde** is any molecule that: has only an H atom on one side of the carbonyl.
- An **acid** is any molecule that: has an -OH group next to the carbonyl.
- A **ketone** is a molecule that: has carbon atoms on both sides next to the carbonyl.

Some simple aldehydes, acids and ketones

Name	Structure	Uses
Formaldehyde (Methanal)		Preservative, precursors to other organic compounds
Acetaldehyde (Ethanal)		Used in making perfumes and food flavors
Formic acid		Both an acid and an aldehyde; used in food preservatives
Acetic acid		Vinegar
Acetone		Used in producing agricultural chemicals



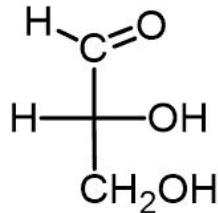
Carbohydrates

- **Carbohydrates** are molecules that are essential for living things. Carbohydrates are found in small simple **sugars** and large complex polymers. Small simple sugars are called **monosaccharides**.
- The smallest monosaccharides have three carbon atoms. These are called **trioses**. Large simple sugars with four, five, six, and seven carbons are called **tetroses**, **pentoses**, **hexoses**, and **heptoses**, respectively.

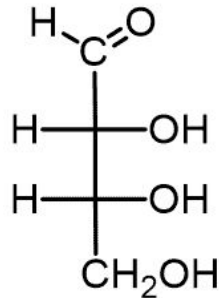
Simple Sugar Carbohydrates

Monosaccharides have three to seven carbon atoms and which is specified with a prefix “**tri**”, “**tetra**”, “**pent**” etc. They are all named by combining the prefix with the common suffix “**ose**”.

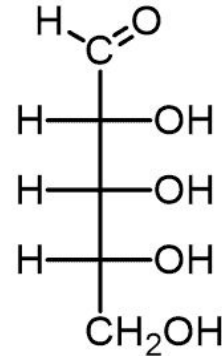
a triose



a tetrose

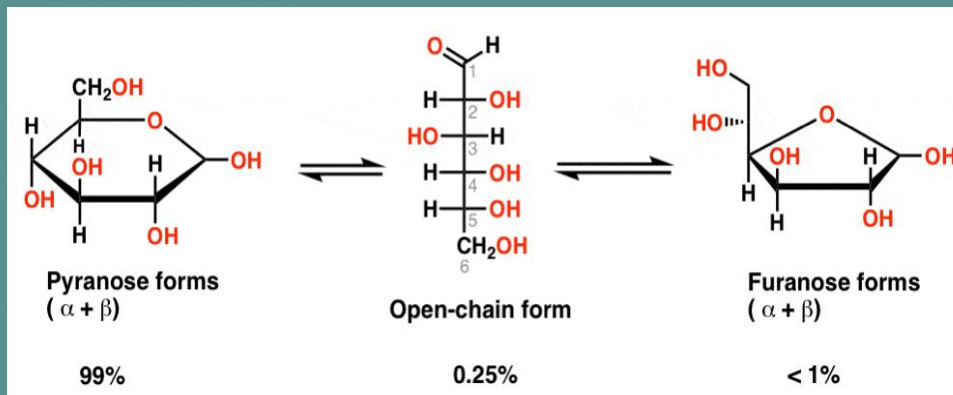


a pentose



Simple Sugar Carbohydrates

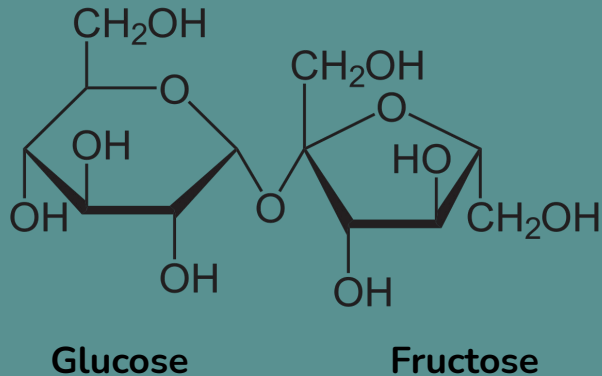
- **Glucose** is a hexose, a subcategory of the monosaccharides with six carbon atoms. It exists in equilibrium between its open-chain and cyclic forms.



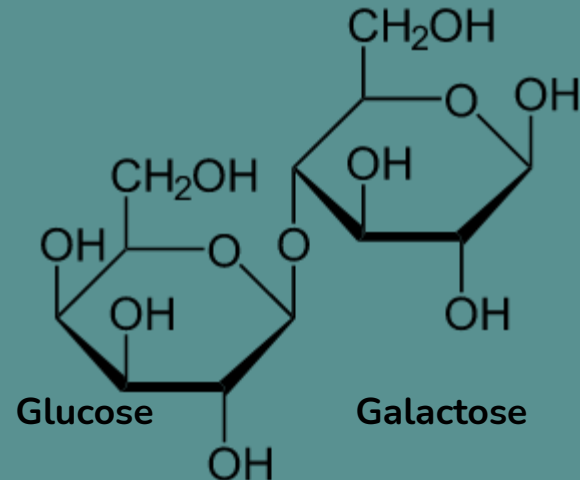
Disaccharide

- When single sugars are added one to another, larger and more complex carbohydrates are formed. When two monosaccharides are connected, the molecule becomes a **disaccharide**.

Sucrose (Table Sugar)

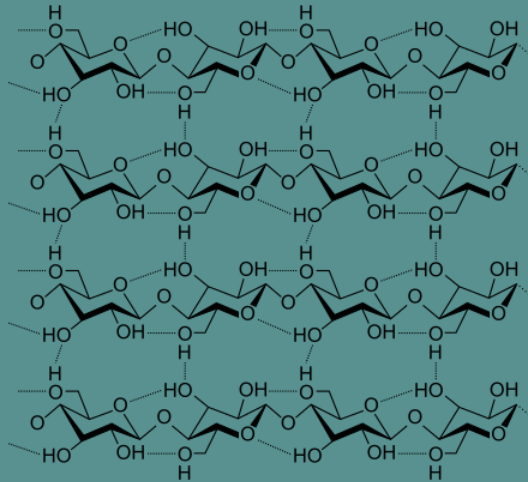


Lactose (Sugar found in Milk)



Oligosaccharide and Polysaccharide

- When a few (more than two) saccharides are added together, the molecule is called a **oligosaccharide**, and when many saccharides are added together in a long chain, the molecule is called **polysaccharides**.



Cellulose is a polysaccharide. It is made up of long-chain glucose polymers that stack on top of each other.

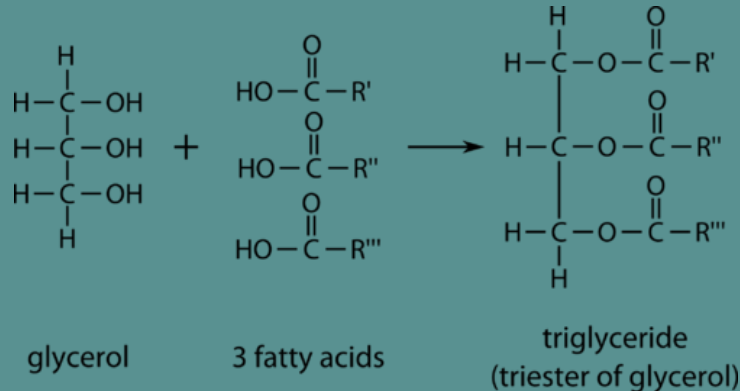


Lipids: Fats and Steroids

- Another important group of nutrients required for the healthy maintenance and function of our bodies are the **lipids**.
- Lipids include fats, steroids, waxes, fat-soluble vitamins, and other molecules.
- **Fats** allow the body to absorb fat-soluble vitamins, provide energy, and are an essential component of cellular membranes.
- **Steroids** are found in both plants and animals and are among the most important natural products.

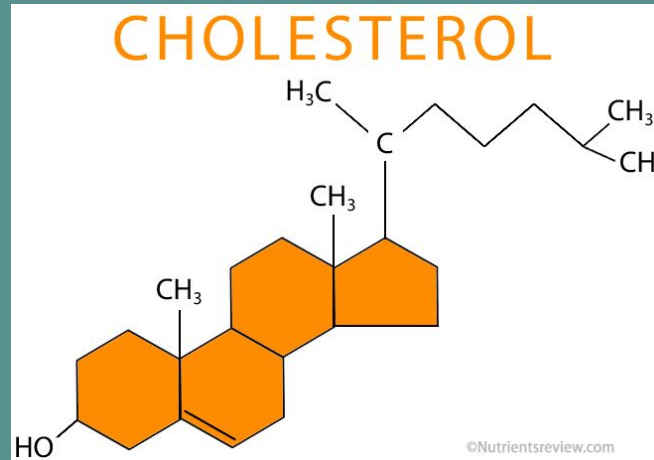
Fats

- The most common fats in living things are made from **glycerol**.
- Glycerol is a small three-carbon carbohydrate. Fats are made of a derivative of glycerol, called a **triglyceride**.



Steroids

- **Cholesterol** is the most common steroid found in animals. Cholesterol is a type of lipid found in the brain and spinal column tissues of humans and is the major component in the plasma membranes of animal cells.





Summary

- Organic chemistry deals with carbon containing compounds.
- Alkanes, alkenes, alkynes, and aromatics are groups of organic molecules that contain only hydrogen and carbon.
- Functional groups are discussed.
- Carbohydrates are made of simple sugars or chains of simple sugars and provide energy for living things.
- Cellulose is a type of polysaccharide, it is found in plants.
- Lipids include fats and steroids and other organic molecules.