

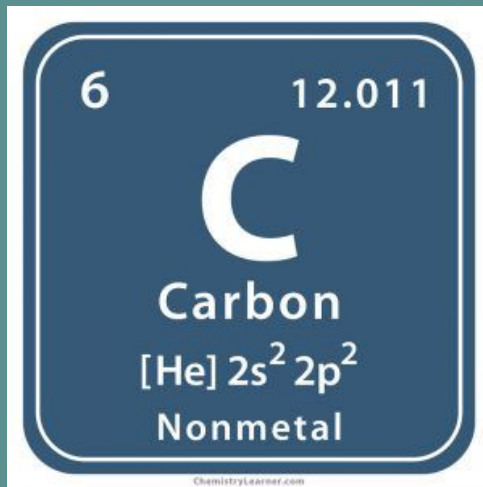
Unit 3- Lesson 8

Chemistry 0

April 2021, L. Tracey Gao

Intro to Organic Chemistry



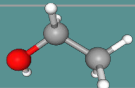

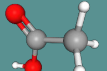
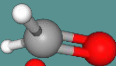
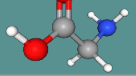

- Organic chemistry is a special branch of chemistry that singles out just one element for special consideration- **Carbon**.



Difference between Organic and Inorganic Compounds

Organic Compounds	Inorganic Compounds
Characterized by the presence of carbon atoms	Most do not have carbon atoms in them
More volatile and highly inflammable	Not inflammable and non-volatile in nature
Insoluble in water	Soluble in water
Mainly found in most of the living things	Found in non-living things
Examples include fats, nucleic acids, sugars, enzymes, proteins and hydrocarbon fuels	Examples include non-metals, salts, metals, acids, and bases
Biological and more complex in nature	Mineral and not much complexity in nature

Common Organic Molecules

Name	Chemical Formula	Structure
Methane	CH_4	
Acetylene	C_2H_2	
Ethanol	$\text{CH}_3\text{CH}_2\text{OH}$	
Chloroform	CHCl_3	
Acetic Acid	CH_3COOH	
Formaldehyde	H_2CO	
Glycine	$\text{H}_2\text{NCH}_2\text{COOH}$	
Benzene	C_6H_6	



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



Alkanes

- The simplest organic molecules are the alkanes which have only single bonds and contain only carbon and hydrogen.
- The shortest alkane molecule is methane, CH_4 .
- The small alkanes are gases, the medium ones (from pentane on) are liquids, and the larger ones are solids.
- All the alkanes are very nonpolar. The liquids are gasoline-like or oily and act as solvents for nonpolar substances. The solids are waxes or plastics.
- They all burn in air and are often used as fuels.

Alkanes

The First 10 Straight-Chain Alkanes

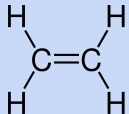
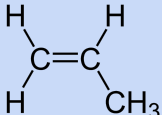
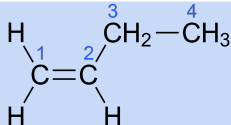
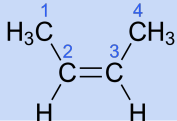
Name	Molecular Formula (C_nH_{2n+2})	Condensed Structural Formula	Properties
methane	CH ₄	CH ₄	gas
ethane	C ₂ H ₆	CH ₃ CH ₃	gas
propane	C ₃ H ₈	CH ₃ CH ₂ CH ₃	gas
butane	C ₄ H ₁₀	CH ₃ CH ₂ CH ₂ CH ₃	gas
pentane	C ₅ H ₁₂	CH ₃ CH ₂ CH ₂ CH ₂ CH ₃	liquid
hexane	C ₆ H ₁₄	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₃	liquid
heptane	C ₇ H ₁₆	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₃	liquid
octane	C ₈ H ₁₈	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₃	liquid
nonane	C ₉ H ₂₀	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₃	liquid
decane	C ₁₀ H ₂₂	CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₂ CH ₃	liquid



Alkenes and Alkynes

- An **alkene** is any organic molecule with a carbon-to-carbon double bond.
- An **alkyne** is any molecule with a carbon-to-carbon triple bond.
- The smaller alkenes and alkynes are gases, the medium ones are nonpolar liquids, and the large ones are waxy solids or plastics.
- They burn in air. Gasoline is a mixture of many organic molecules including large amounts of both alkanes and alkenes.

Alkenes (a few common examples)

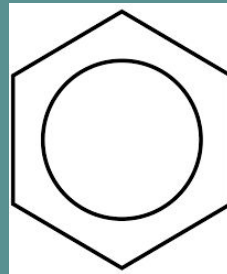
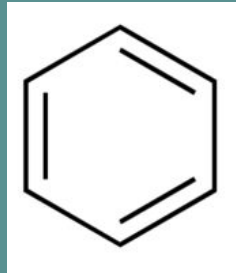
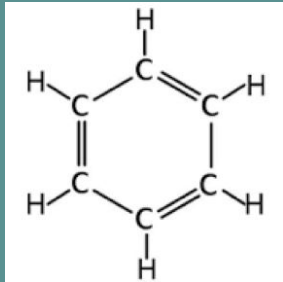
Name	Formula	Structure	Uses
ethene (ethylene)	C_2H_4		Plant hormone that causes ripening of fruit
propene (propylene)	C_3H_6		Monomer used to make polypropylene, a common polymer
1-butene (butylene)	C_4H_8		Monomer used to make polybutylene, a common polymer
2-butene	C_4H_8		Used in the production of gasoline

Alkynes (a few common examples)

Name	Formula	Structure	Uses
ethyne (acetylene)	C_2H_2	$H-C\equiv C-H$	Used in welding and cutting torches
propyne	C_3H_4	$\begin{array}{c} H \\ \\ H-C\equiv C-C-H \\ \\ H \end{array}$	Used in welding torches
1-butyne	C_4H_6	$\begin{array}{c} H & H \\ & \\ H-C\equiv C-C-C-H \\ & \\ H & H \end{array}$	Used in the synthesis of organic compounds
2-butyne	C_4H_6	$H_3C-C\equiv C-CH_3$	Used in the synthesis of organic compounds

Aromatics

- The last and most complex of the hydrocarbons are the aromatic molecules.
- The simplest aromatic molecule is benzene.
- It is a ring of six carbon atoms and six hydrogens in the shape of a hexagon. There are three double bonds alternating with three single bonds around the ring.





Summary

- Organic chemistry deals with carbon containing compounds.
- Alkanes, alkenes, alkynes, and aromatics are groups of organic molecules that contain only hydrogen and carbon.