

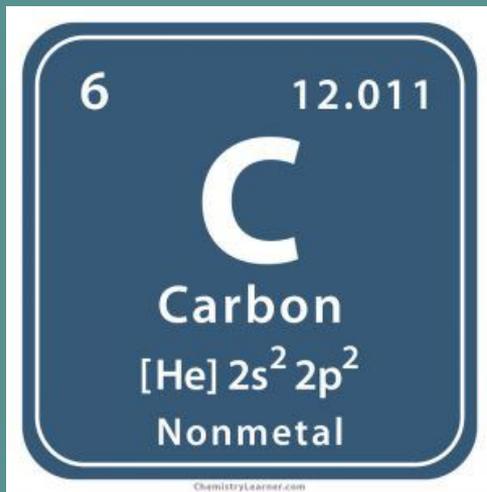
# Unit 3- Lesson 8

Chemistry 0

April 2022, L. Tracey Gao

# Intro to Organic Chemistry

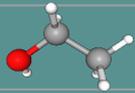
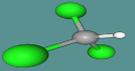
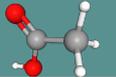
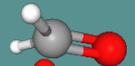
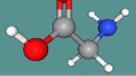
- Organic chemistry is a special branch of chemistry that singles out just one element for special consideration- **Carbon**.



# Difference between Organic and Inorganic Compounds

<b>Organic Compounds</b>	<b>Inorganic Compounds</b>
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	$\text{CH}_4$	
Acetylene	$\text{C}_2\text{H}_2$	
Ethanol	$\text{CH}_3\text{CH}_2\text{OH}$	
Chloroform	$\text{CHCl}_3$	
Acetic Acid	$\text{CH}_3\text{COOH}$	
Formaldehyde	$\text{H}_2\text{CO}$	
Glycine	$\text{H}_2\text{NCH}_2\text{COOH}$	
Benzene	$\text{C}_6\text{H}_6$	



## 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<sub>4</sub>.
- 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

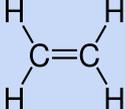
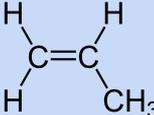
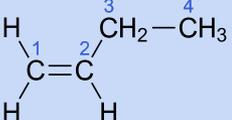
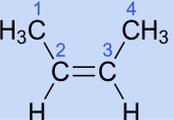
Name	Molecular Formula (C <sub>n</sub> H <sub>2n+2</sub> )	Condensed Structural Formula	Properties
methane	CH <sub>4</sub>	CH <sub>4</sub>	gas
ethane	C <sub>2</sub> H <sub>6</sub>	CH <sub>3</sub> CH <sub>3</sub>	gas
propane	C <sub>3</sub> H <sub>8</sub>	CH <sub>3</sub> CH <sub>2</sub> CH <sub>3</sub>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

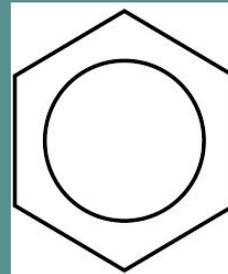
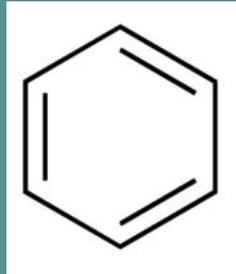
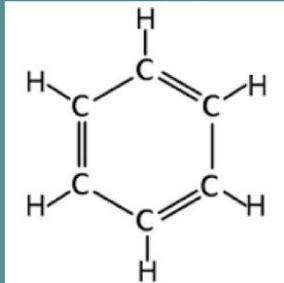
Name	Formula	Structure	Uses
ethene (ethylene)	$C_2H_4$		Plant hormone that causes ripening of fruit
propene (propylene)	$C_3H_6$		Monomer used to make polypropylene, a common polymer
1-butene (butylene)	$C_4H_8$		Monomer used to make polybutylene, a common polymer
2-butene	$C_4H_8$		Used in the production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