

CH 22: ORGANIC CHEMISTRY

Honors Chemistry

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Section 22.1 Organic Chemistry

Organic Chemistry: study of covalently bonded compounds containing carbon

- ▣ **Hydrocarbons** – simplest organic compounds, composed **only of carbon and hydrogen**
- ▣ Types
 - Alkanes
 - Alkenes
 - Alkynes

Alkanes

Hydrocarbons whose carbon atoms are connected by **single covalent bonds**

General Formula



May be straight chain or cyclic



May be un-branched or branched

Alkanes

Saturated hydrocarbons – each carbon atom in the molecule forms four single covalent bonds

Each carbon has the maximum number of hydrogens bonded to it

- Number of carbons determines its name:
Greek/Latin prefixes ending with **-ane**

Carbon-Carbon Chain Prefixes

PREFIX	Number of carbon atoms
meth-	1
eth-	2
prop-	3
but-	4
pent-	5
hex-	6
hept-	7
oct-	8
non-	9
dec-	10

Systematic Names of Alkanes

IUPAC Rules for Naming Alkanes:

1. Name the longest chain of carbons in the molecule
2. Number the carbons so that any of the branches get the lowest numbers
3. Recognize the alkyl groups that are branched off of the numbered carbon
 1. CH_3 – *methyl*
 2. C_2H_5 – *ethyl*

Alkenes

Hydrocarbons that contain double covalent bonds

- General Formula



An *unsaturated* hydrocarbon contains one or more carbons that do not have four single covalent bonds

- use same Greek/Latin prefixes but end with **-ene**

Systematic Names of Alkenes

Use the rules for alkanes, with the following exceptions:

1. Name the parent hydrocarbon, add the suffix *-ene*, if there is more than one double bond, modify the suffix to indicate the number: 2 = **-adiene**
2. Number the carbon atoms in the parent hydrocarbon
3. Insert the position numbers
4. Punctuate the name

Alkynes

Hydrocarbons that contain triple covalent bonds

- General Formula



Use the same Greek/Latin prefixes but end with ***-yne***

Systematic Names of Alkynes

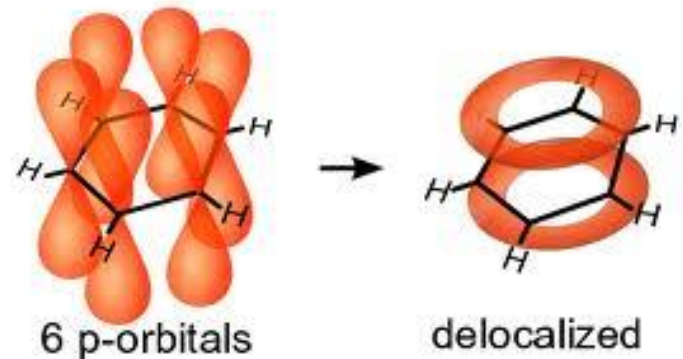
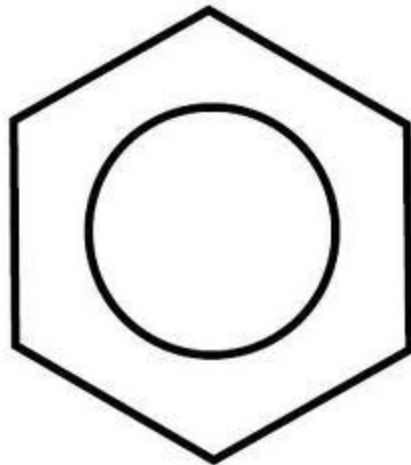
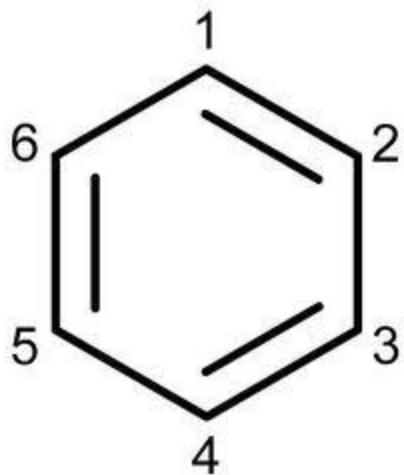
Use the rules for alkanes, with the following exceptions:

1. Name the parent hydrocarbon, add the suffix *-yne*, if there is more than one triple bond, modify the suffix to indicate the number: 2 = **-adiyne**
2. Number the carbon atoms in the parent hydrocarbon
3. Insert the position numbers
4. Punctuate the name

Aromatic Hydrocarbons

Hydrocarbons that have six membered carbon rings and delocalized electrons.

- Benzene is the primary aromatic hydrocarbon
 - ▣ C_6H_6



Summary

Alkanes: C_nH_{2n+2}

- Single bonds
- Saturated hydrocarbons

Alkenes: C_nH_{2n}

- Double bond
- Unsaturated hydrocarbons

Alkynes: C_nH_{2n-2}

- Triple bond
- Unsaturated hydrocarbon

Aromatic Hydrocarbons

- Benzene ring!

Organic Functional Groups

Group	Formula
Alcohol	$\text{R}-\text{O}-\text{H}$
Ether	$\text{R}-\text{O}-\text{R}'$
Amine	$\text{R}-\text{N}-\text{H}$ H
Amide	$\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2$

Organic Functional Groups

Group	Formula
Aldehyde	$\begin{array}{c} \text{O} \\ \parallel \\ \text{R}-\text{C}-\text{H} \end{array}$
Ketone	$\begin{array}{c} \text{O} \\ \parallel \\ \text{R}_1-\text{C}-\text{R}_2 \end{array}$
Carboxylic acid	$\begin{array}{c} \text{O} \\ \parallel \\ \text{R}-\text{C}-\text{OH} \end{array}$
Ester	$\begin{array}{c} \text{O} \\ \parallel \\ \text{R}-\text{C}-\text{OR}' \end{array}$