

# Nomenclature Tutorial:

**This tutorial focuses on naming organic compounds using the IUPAC rules:**

- 1. Alkanes(C-C)**
- 2. Alkenes(C=C)**
- 3. Alkynes(C≡C)**
- 4. Cyclic structures**
- 5. Aromatic**
- 6. Functional groups**

# Organic Chemistry:

Organic Chemistry- That branch of chemistry which centres on carbon and its compounds.

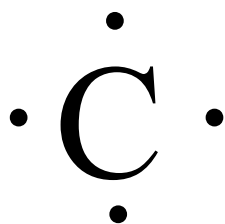
## Greek Prefixes:

<b>mono</b>	<b>1</b>	<b>hexa</b>	<b>6</b>
<b>di</b>	<b>2</b>	<b>hepta</b>	<b>7</b>
<b>tri</b>	<b>3</b>	<b>octa</b>	<b>8</b>
<b>tetra</b>	<b>4</b>	<b>nona</b>	<b>9</b>
<b>penta</b>	<b>5</b>	<b>deca</b>	<b>10</b>

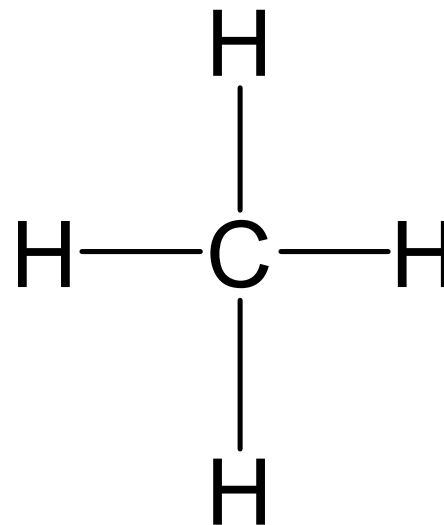
# Alkanes:

Alkanes: A hydrocarbon(compound containing only carbon and hydrogen) in which all carbon-carbon bonds are single bonds.

Carbon forms 4 bonds.



Simplest alkane is methane.

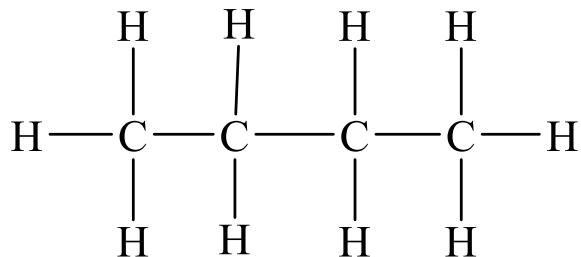


# Alkanes:

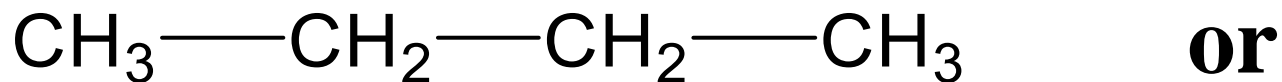
<b>n</b>	<b>Compound</b>	<b>Name</b>
<b>1</b>	<b>CH<sub>4</sub></b>	<b>methane</b>
<b>2</b>	<b>CH<sub>3</sub>-CH<sub>3</sub></b>	<b>ethane</b>
<b>3</b>	<b>CH<sub>3</sub>-CH<sub>2</sub>-CH<sub>3</sub></b>	<b>propane</b>
<b>4</b>	<b>CH<sub>3</sub>-CH<sub>2</sub>-CH<sub>2</sub>-CH<sub>3</sub></b>	<b>n-butane</b>
<b>5</b>	<b>CH<sub>3</sub>-(CH<sub>2</sub>)<sub>3</sub>-CH<sub>3</sub></b>	<b>n-pentane</b>
<b>6</b>	<b>CH<sub>3</sub>-(CH<sub>2</sub>)<sub>4</sub>-CH<sub>3</sub></b>	<b>n-hexane</b>
<b>7</b>	<b>CH<sub>3</sub>-(CH<sub>2</sub>)<sub>5</sub>-CH<sub>3</sub></b>	<b>n-heptane</b>
<b>8</b>	<b>CH<sub>3</sub>-(CH<sub>2</sub>)<sub>6</sub>-CH<sub>3</sub></b>	<b>n-octane</b>
<b>9</b>	<b>CH<sub>3</sub>-(CH<sub>2</sub>)<sub>7</sub>-CH<sub>3</sub></b>	<b>n-nonane</b>
<b>10</b>	<b>CH<sub>3</sub>-(CH<sub>2</sub>)<sub>8</sub>-CH<sub>3</sub></b>	<b>n-decane</b>

# Drawing Organic Structures:

Consider n-butane:  $C_4H_{10}$ .

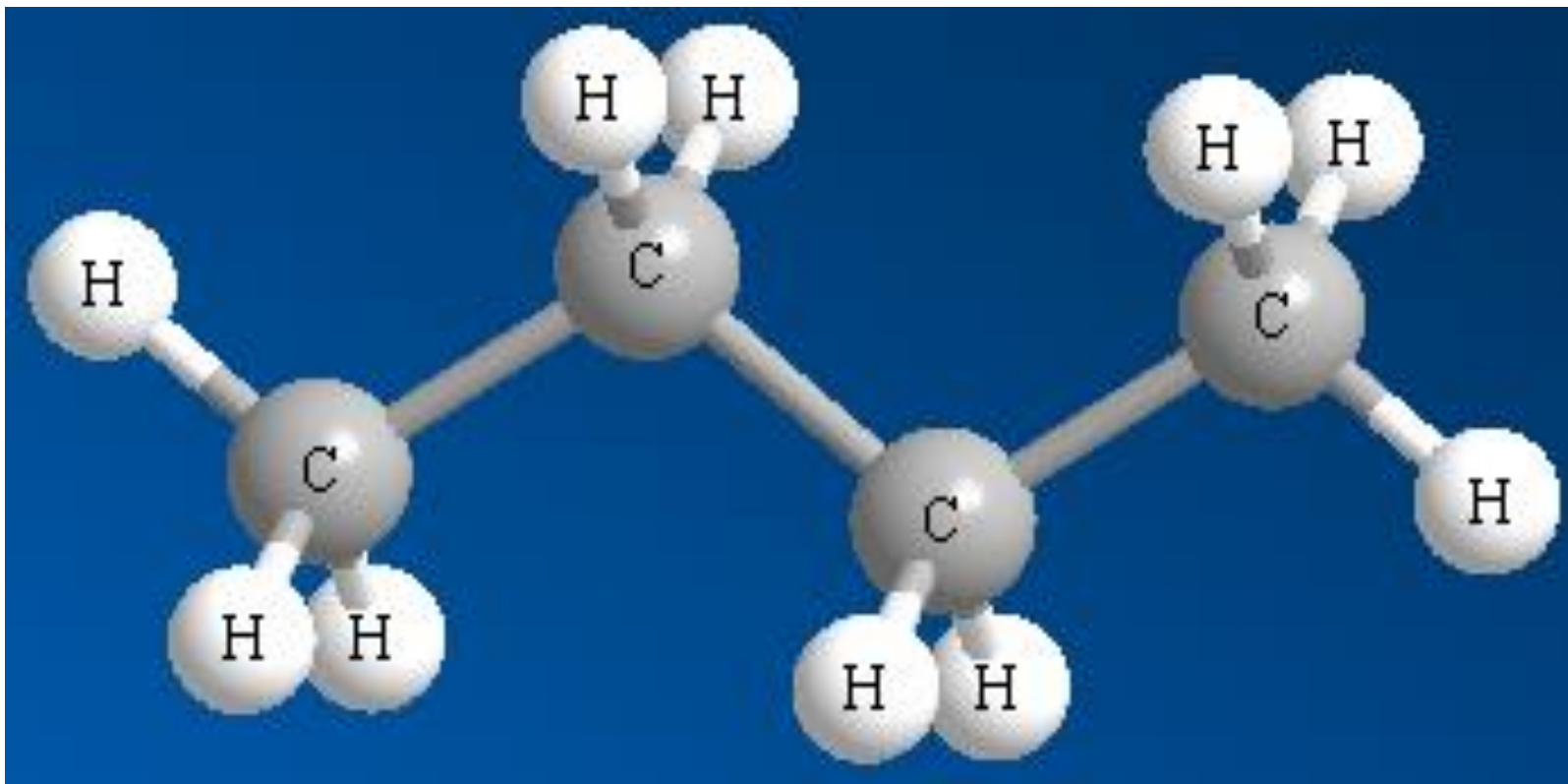


also written as



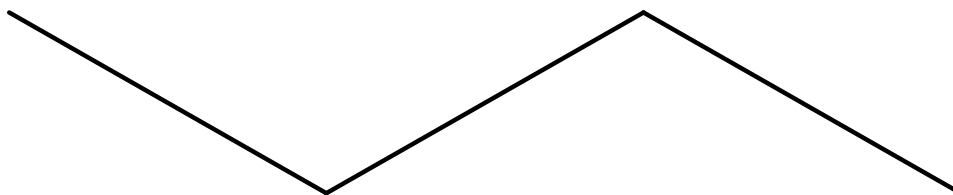
# Drawing Organic Structures:

Consider n-butane:  $C_4H_{10}$ .



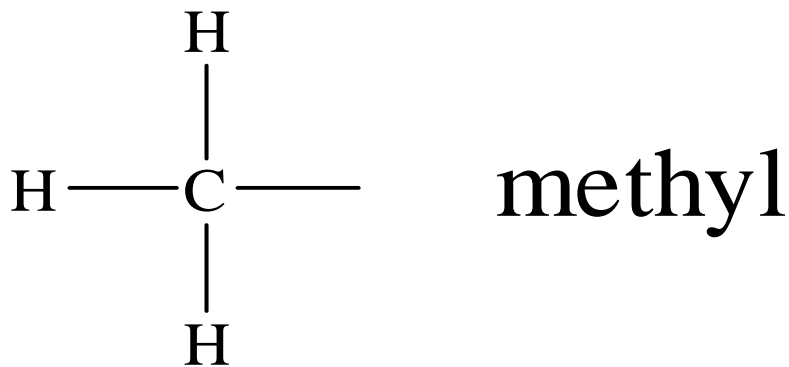
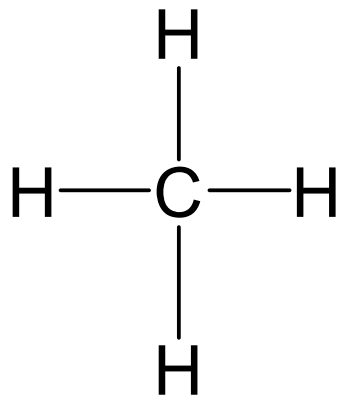
## Line Notation:

**The end of each line represents a carbon atom and the appropriate number of hydrogens.**

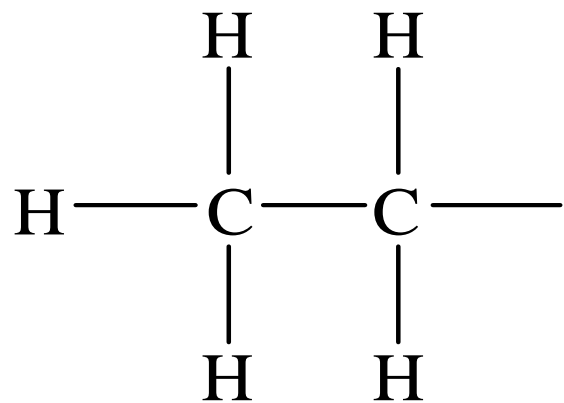


# Alkyl Groups:

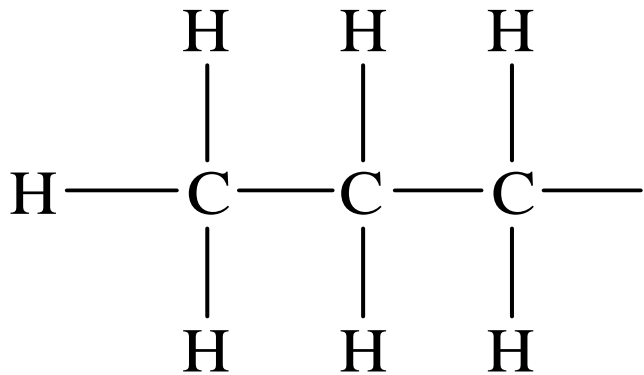
Remove a H from CH<sub>4</sub>(methane) to get a methyl group.







ethyl



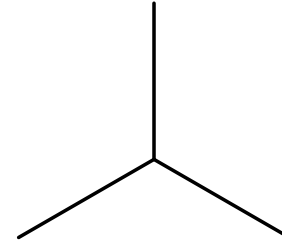
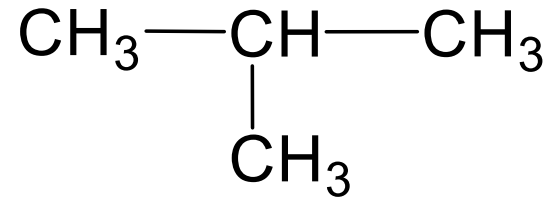
n-propyl

# Naming:

**prefix - parent - suffix**

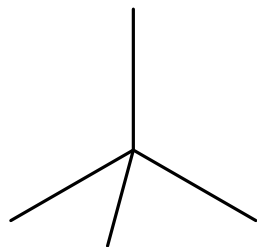
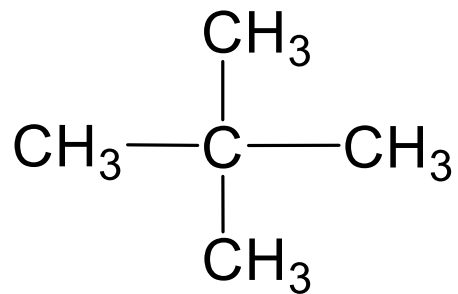
**Identify the longest chain of C atoms.  
Identify alkyl and/or side groups and  
location.**

**Ex:**



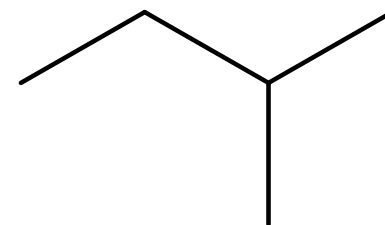
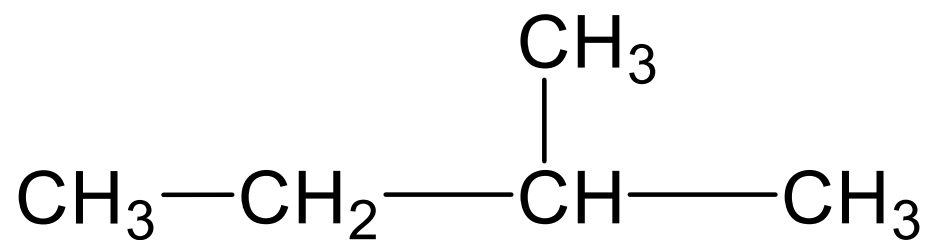
**methylpropane**

**Ex:2**



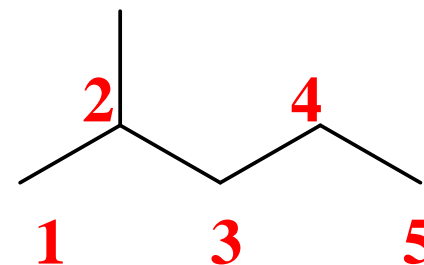
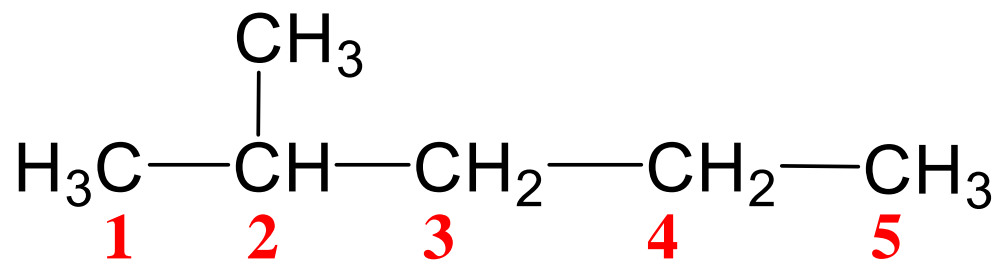
**dimethylpropane**

**Ex:3**



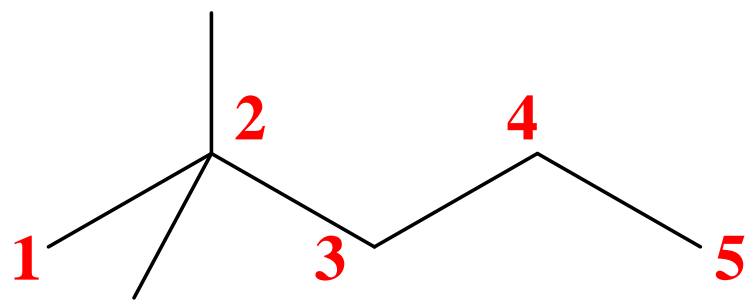
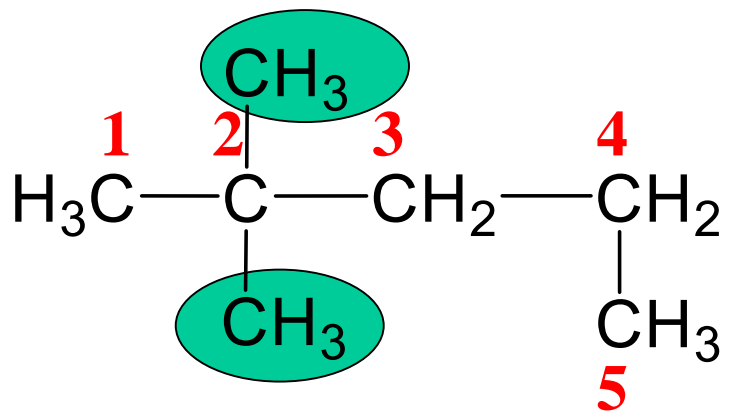
**methylbutane**

# Ex:4



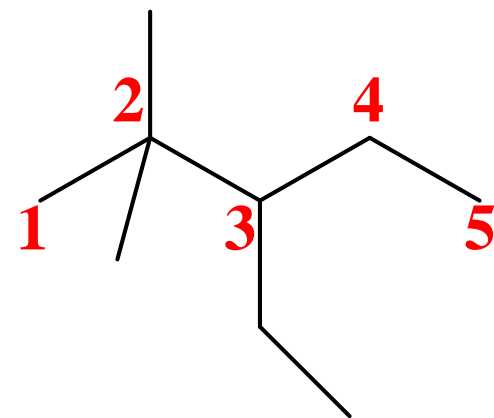
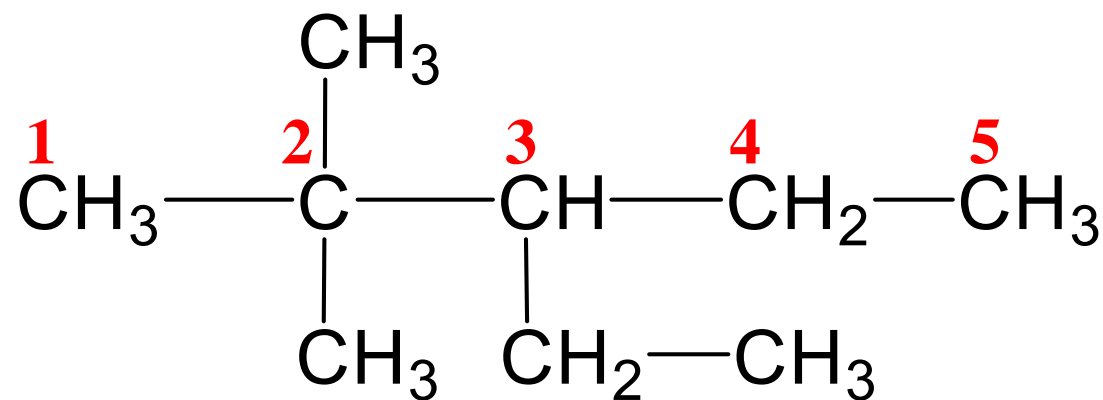
**2-methylpentane**

# Ex:5



**2,2-dimethylpentane**

# Ex:6



**3-ethyl-2,2-dimethylpentane**



## **Alkenes:**

**Alkenes are hydrocarbons which have a carbon-carbon double bond somewhere in the structure.**

## **Naming Alkenes:**

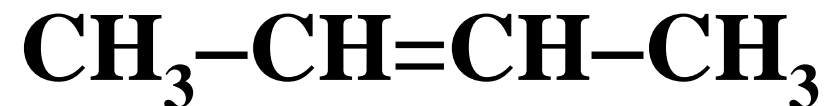
**Name derived from the corresponding alkane, except the ending is changed from "ane" to "ene."**

## Alkenes cont...

For alkenes containing more than 4 carbon atoms, the position of the double bond must be indicated.      Ex:



1-butene

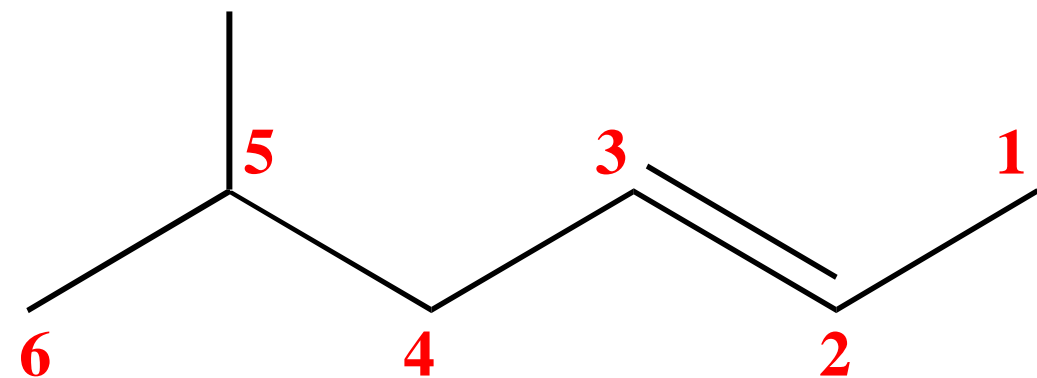


2-butene

# Alkenes cont...

In naming alkenes the largest chain is numbered to give the lowest number to the double bond.

Ex:



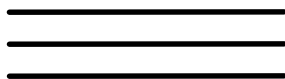
5-methyl-2-hexene

# **Alkynes:**

**Hydrocarbons that contain at least one carbon-carbon triple bond. When naming, the ending "ane" of the corresponding alkane is replaced with the ending "yne."**

## Alkynes cont:

**H-C≡C-H** ethyne. Also known as  
acetylene.

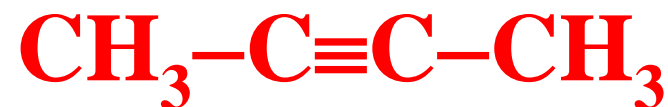
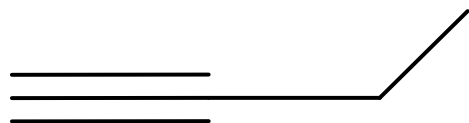


# Alkynes cont:

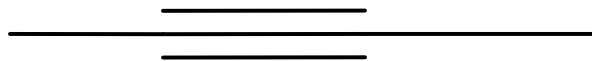
Position of the triple bond must be indicated.



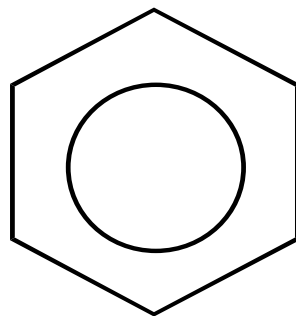
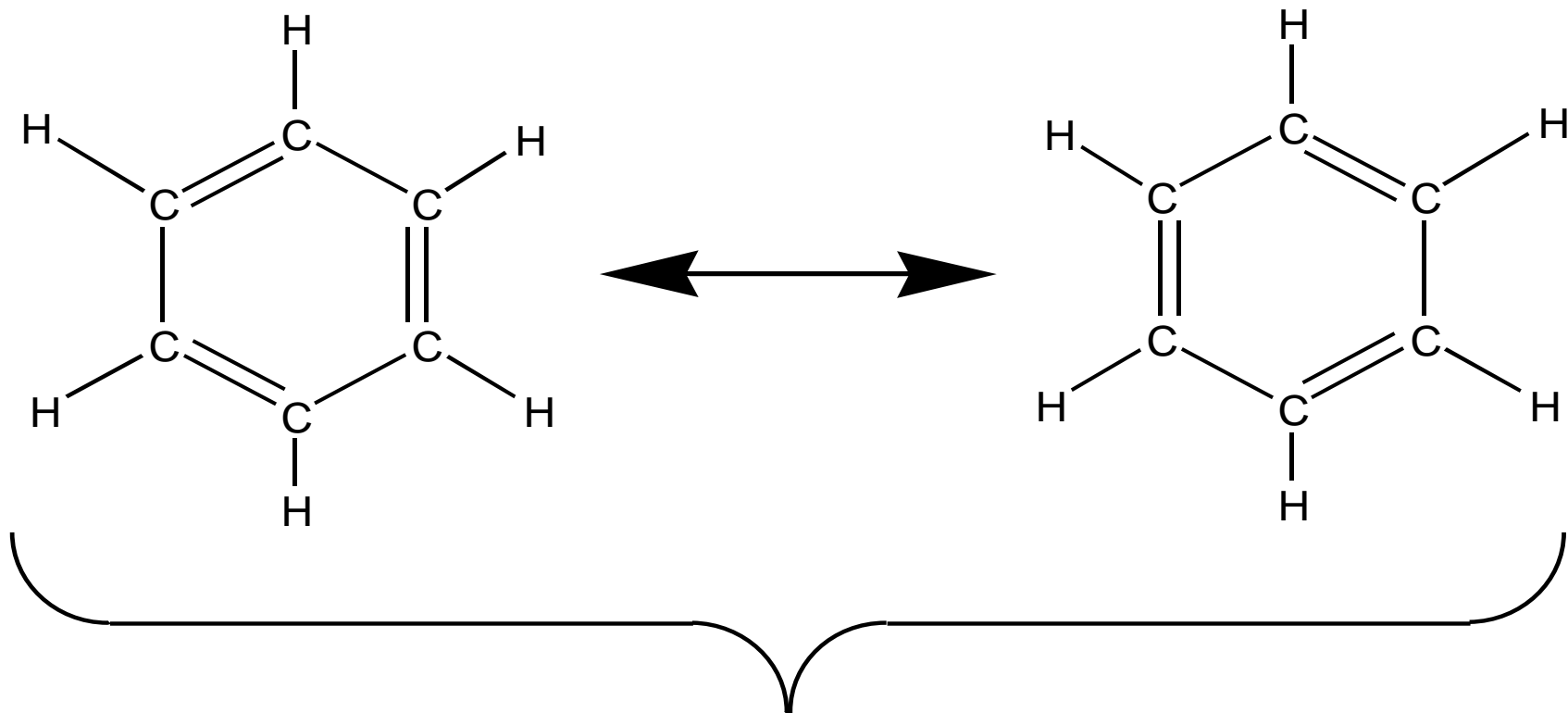
1-butyne



2-butyne

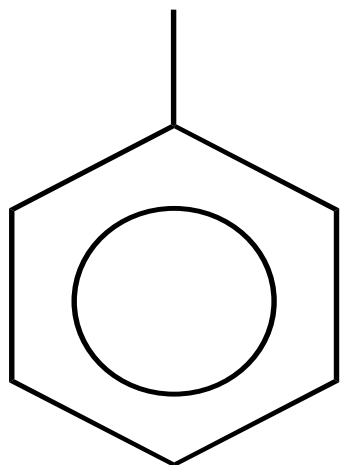


# Aromatic Hydrocarbons:

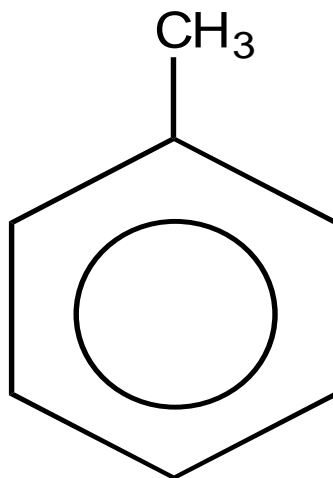


Benzene ring may be represented as follows.

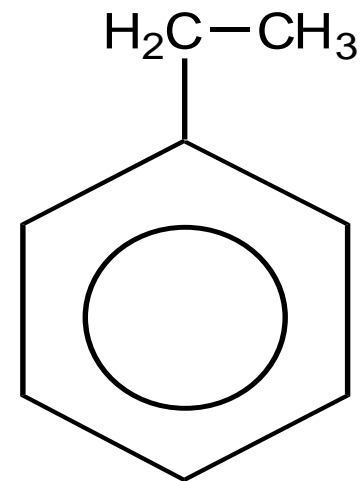
# Derivatives of Benzene:



Phenyl group



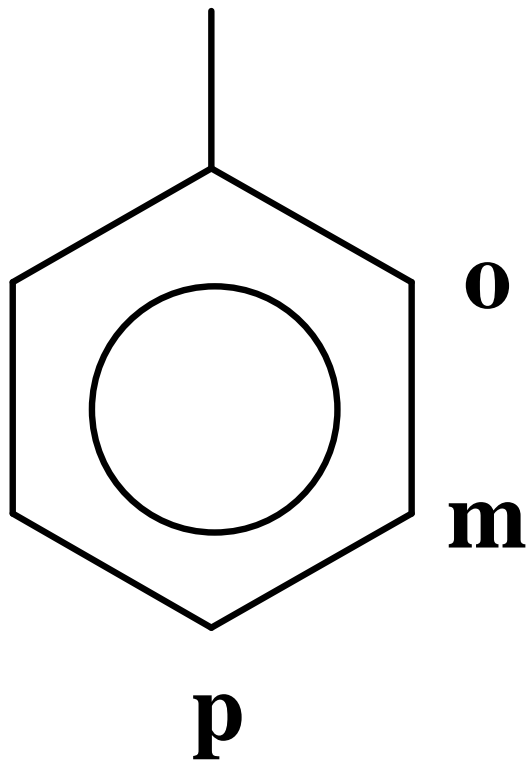
methylbenzene  
or  
toluene



ethylbenzene



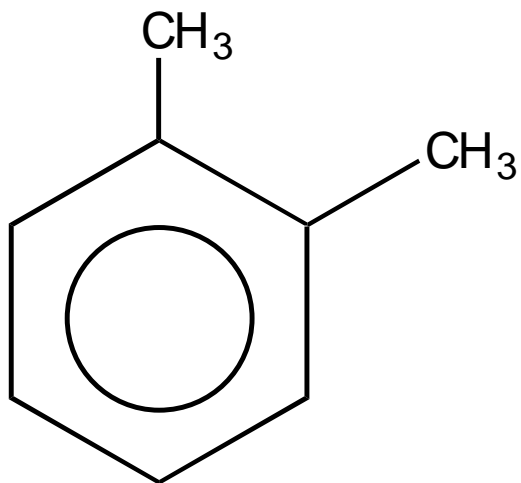
# Disubstituted Benzene Ring:



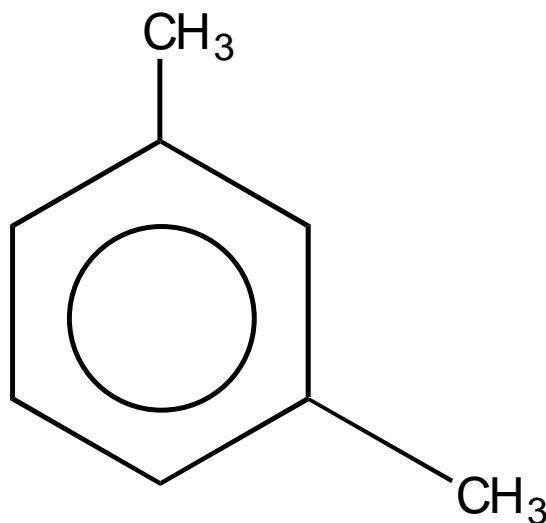
# Substituted Benzene:

**Ex: dimethyl substituted benzene.**

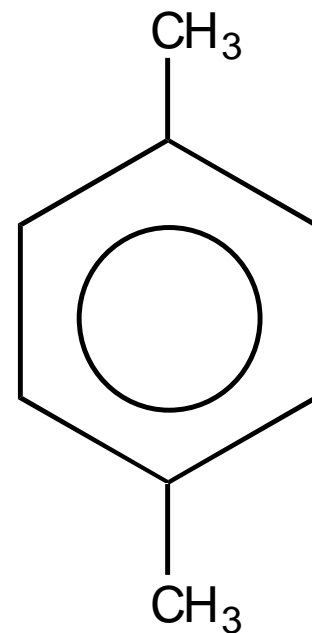
**Use ortho(o), meta(m), and para(p) for disubstituted benzenes.**



2-xylene  
o-xylene

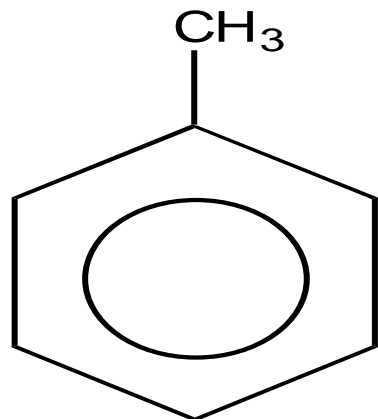


3-xylene  
m-xylene

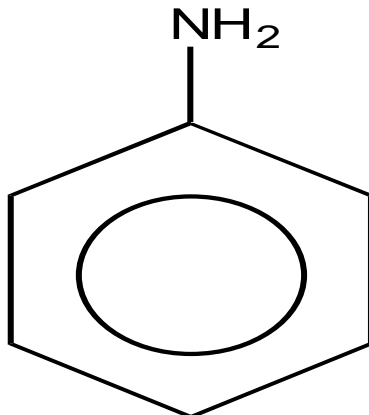


4-xylene  
p-xylene

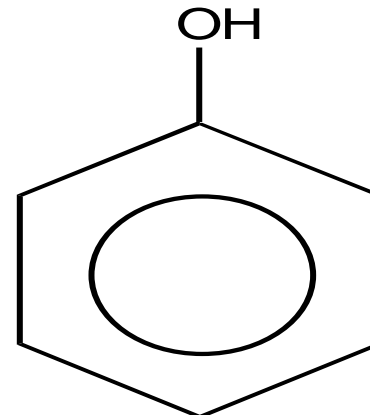
# Some Benzene Compounds:



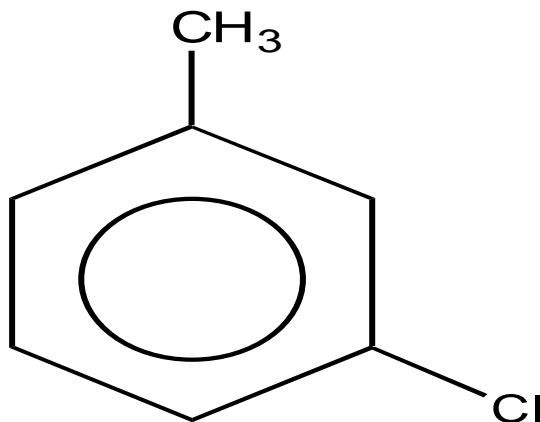
toluene



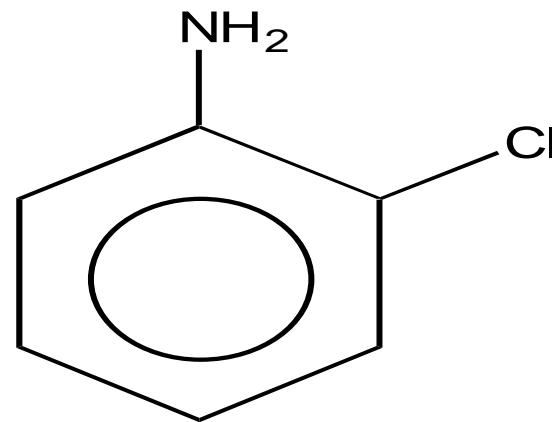
aniline



hydroxybenzene  
or  
phenol



m-chlorotoluene



o-chloroaniline

# Identifying and Naming Functional Groups:

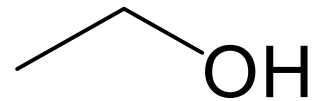
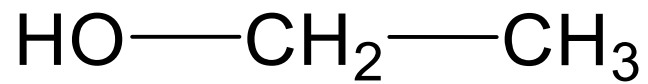
Compound	Functional Group	Ending
Alkene	$C=C$	ene
Alkyne	$C\equiv C$	yne
Alcohol	$C-OH$	anol
Aldehyde	$\begin{array}{c} O \\    \\ H-C- \end{array}$	anal
Ketone	$\begin{array}{c} O \\    \\ C-C-C \end{array}$	anone
Carboxylic acid	$\begin{array}{c} O \\    \\ -C-OH \end{array}$	anoic acid

# Identifying and Naming Functional

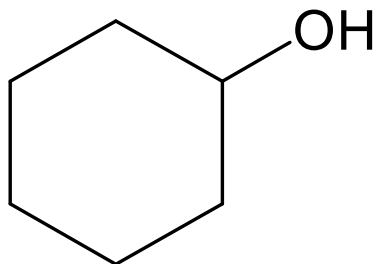
## Groups cont...:

Compound	Functional Group	Ending
Ether	C-O-C	oxy
Ester	$\begin{array}{c} \text{O} \\    \\ \text{C}-\text{O}-\text{C}- \\   \\ \text{C} \end{array}$	anoate
Amines	C-N	anamine
Amide	$\begin{array}{c} \text{O} \\    \\ -\text{C}-\text{N} \\   \\ \text{C} \end{array}$	anamide

# Alcohols:

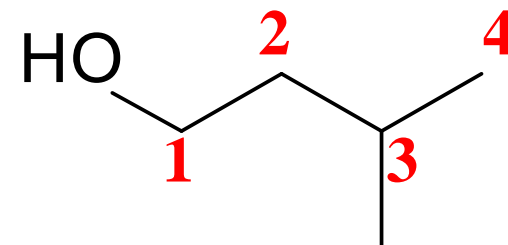
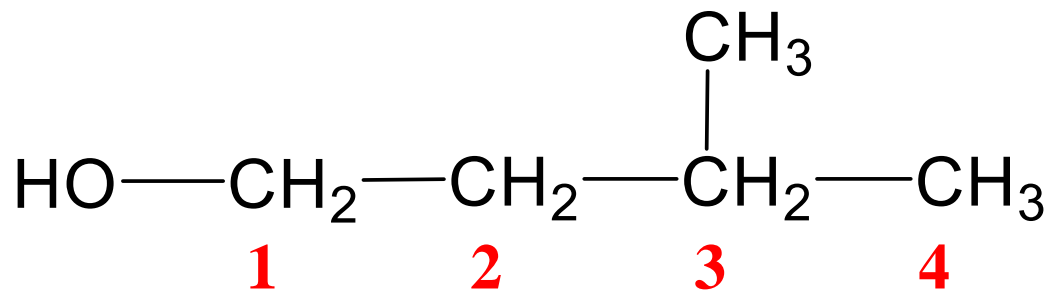


**ethanol**



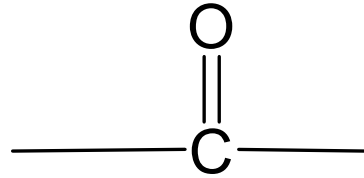
**cyclohexanol**

# Alcohols cont:

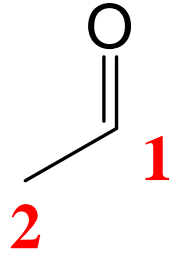
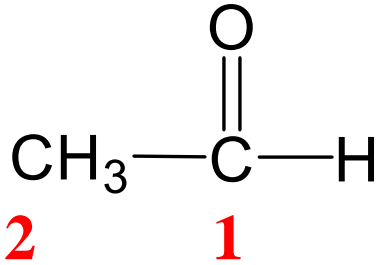


**3-methyl-1-butanol**

# Compounds containing the carbonyl group:



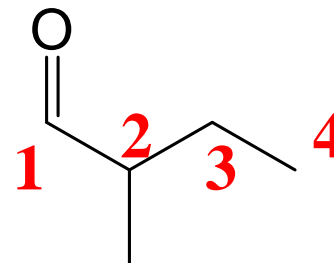
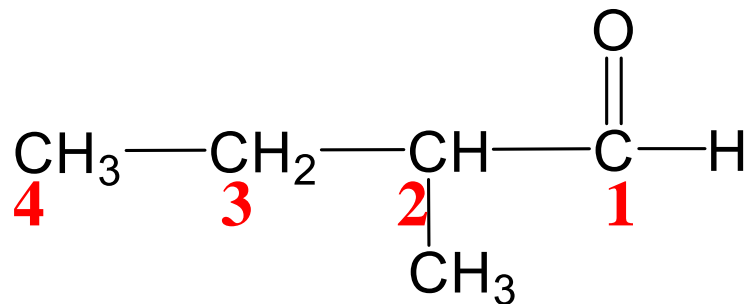
## Aldehydes:



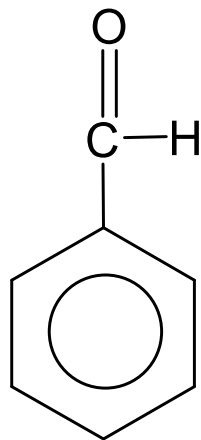
**ethanal**



# Aldehydes cont...:

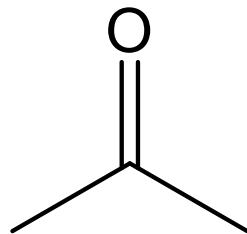
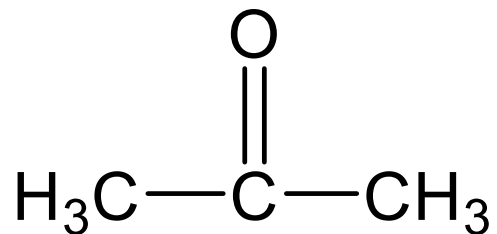


**2-methylbutanal**

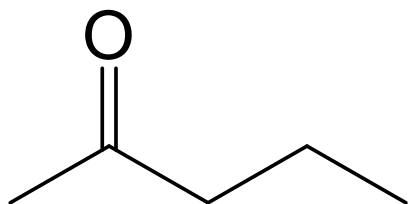


**benzaldehyde**

# Ketones:

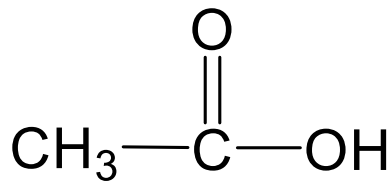


**propanone**



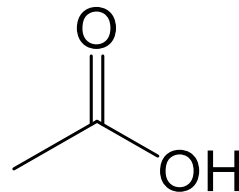
**2-pentanone**

# Carboylic Acids:

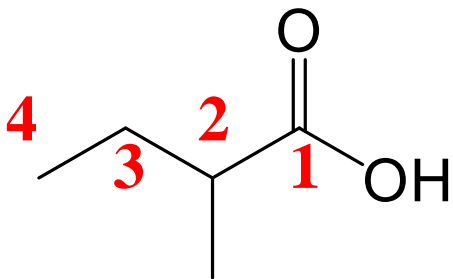


2

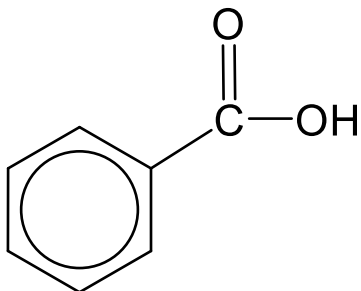
1



**ethanoic acid**

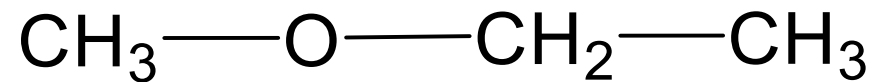


**2-methylbutanoic acid**



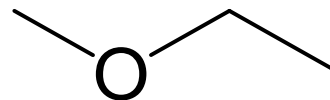
**benzoic acid**

# Ethers:



**methoxy ethane**

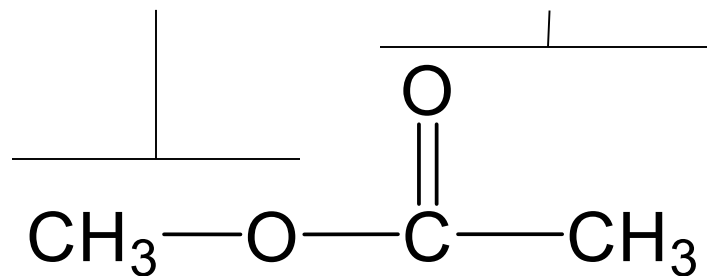
**methoxyethane**



# Esters:

**alcohol**

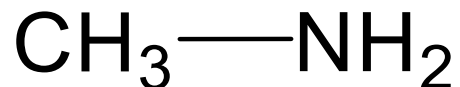
**acid**



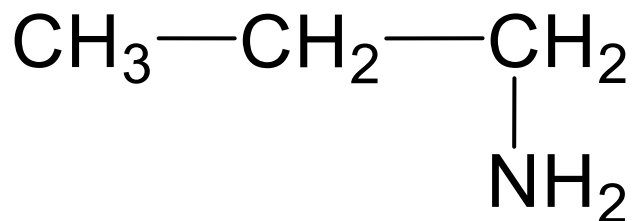
**methyl ethanoate**

# Amines:

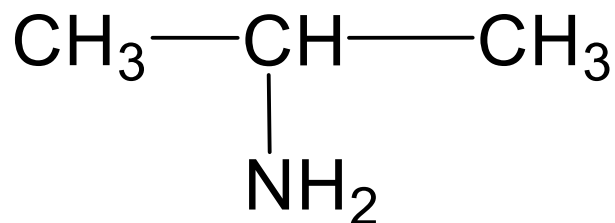
**Amines are derivatives of ammonia(NH<sub>3</sub>).**



**methanamine**



**1-propanamine**

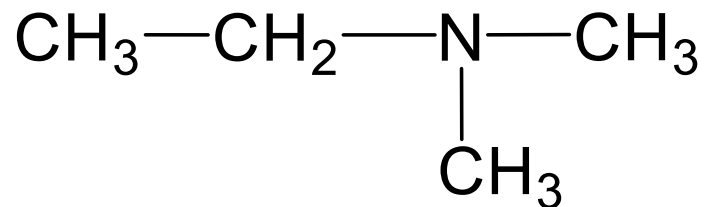
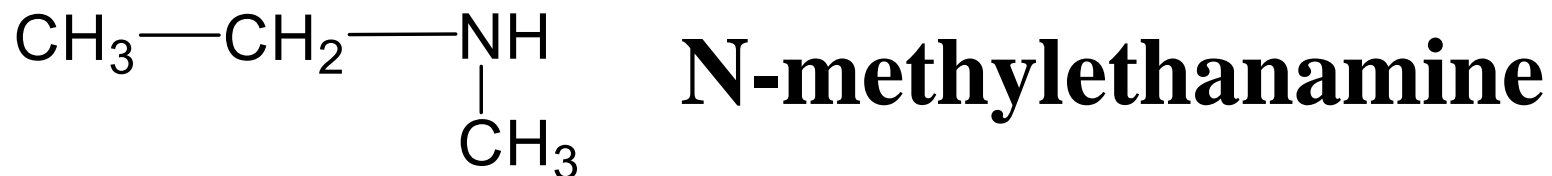


**2-propanamine**

**Examples of primary amines.**

# Amines cont:

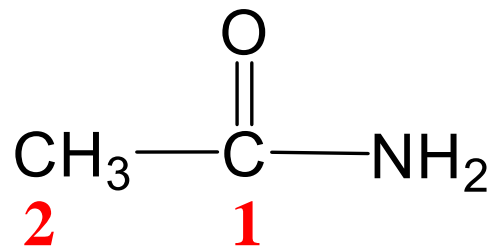
**Secondary amines contain 2 and tertiary contain 3 hydrocarbons attached to N.**



**N,N-dimethylethanamine**

# Amides:

**Amines combine the carbonyl(C=O) group with the amine(N).**



**ethanamide**