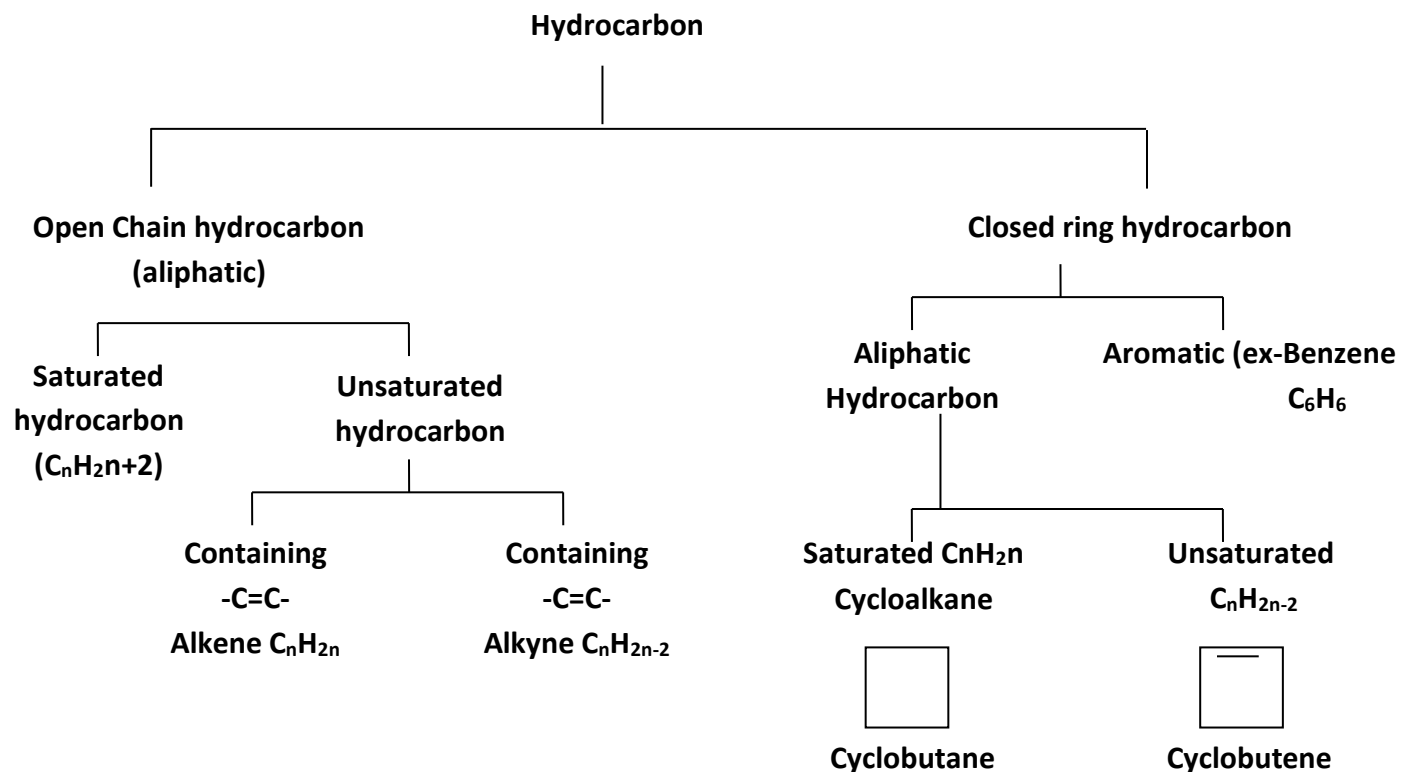


# Organic Chemistry

(Unit -3)

**Hydrocarbon:** Hydrocarbons are compounds of carbon and hydrogen.

Classification:



## ALIPHATIC HYDROCARBON:

The open chain hydrocarbons are called aliphatic hydrocarbon. It is of two types-

- a) Saturated hydrocarbon
- b) Unsaturated hydrocarbon

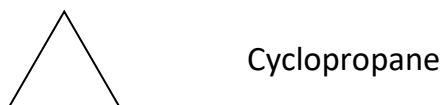
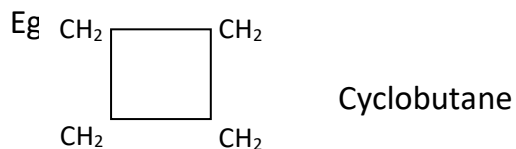
## Q) Difference between saturated and unsaturated hydrocarbon.

SATURATED HYDRO CARBON	UNSATURATED HYDRO CARBON
The hydro carbon having carbon-carbon single bond in the chain.	The hydro carbon having carbon-carbon double/triple bond in the chain.
Eg: Alkane(CH <sub>4</sub> , C <sub>2</sub> H <sub>6</sub> etc)	Eg: Alkene(C <sub>2</sub> H <sub>4</sub> etc) and Alkyne(C <sub>2</sub> H <sub>2</sub> etc)

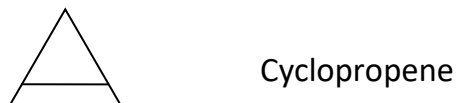
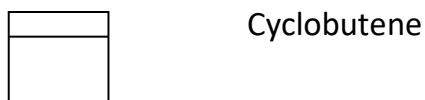
**ALICYCLIC HYDROCARBON:**

The cyclic or ring compound having carbon atom at each corner of ring is called alicyclic hydrocarbon. It is of two types-

## a) Saturated alicyclic hydrocarbon



## b) Unsaturated alicyclic hydrocarbon

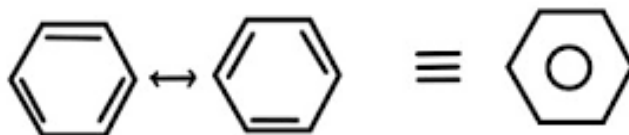
**Q) Define aromatic hydrocarbon. Justify that benzene is an aromatic hydrocarbon.**

**A:** The cyclic hydrocarbon compound which obey Huckel rule that means it contain  $(4n + 2)\pi$  electron. When  $n=0,1,2,\dots$  ( $n$ =no. of rings)

Benzene is having 1 ring that means  $n=1$ , hence

$$(4n + 2)\pi = (4 \times 1 + 2)\pi = 6\pi \text{ Electron}$$

According to Huckel rule benzene is having  $6\pi$  electron. Hence it is



Benzene is having alternate double bond. Three double bond implies  $6\pi$  electron in benzene. Hence benzene is an aromatic hydrocarbon which Huckel rule.

**IUPAC Nomenclature :**

Alkanes having suffix -ane with general formula  $C_nH_{2n+2}$ .

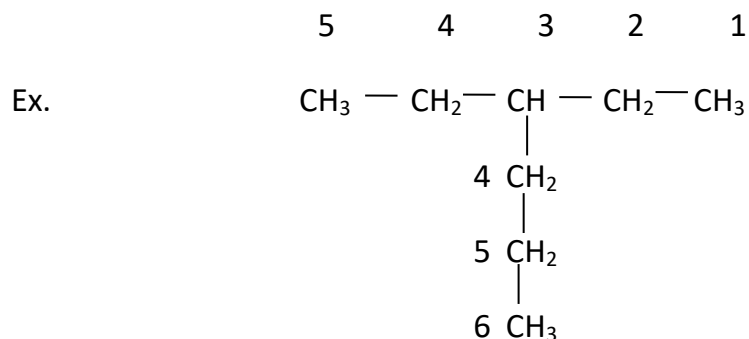
C <sub>1</sub> methane	CH <sub>4</sub>	C <sub>6</sub>	Hexane	C <sub>6</sub> H <sub>14</sub>
C <sub>2</sub> Ethane	C <sub>2</sub> H <sub>6</sub>	C <sub>7</sub>	Heptane	C <sub>7</sub> H <sub>16</sub>
C <sub>3</sub> Propane	C <sub>3</sub> H <sub>8</sub>	C <sub>8</sub>	Octane	C <sub>8</sub> H <sub>18</sub>
C <sub>4</sub> Butane	C <sub>4</sub> H <sub>10</sub>	C <sub>9</sub>	Nonane	C <sub>9</sub> H <sub>20</sub>
C <sub>5</sub> Pentane	C <sub>5</sub> H <sub>12</sub>	C <sub>10</sub>	Decane	C <sub>10</sub> H <sub>22</sub>

The radical of alkane is called alkyl-- , With formula  $C_nH_{2n+1}$  – represented as R – and suffix –yl.

Ex – CH<sub>3</sub> – methyl, C<sub>2</sub>H<sub>5</sub> – Ethyl

**Rules of Nomenclature of alkane:**<a>Longest Chain Rule:-

Count the chain in such a manner that it contains large no. of carbon atom in the chain.

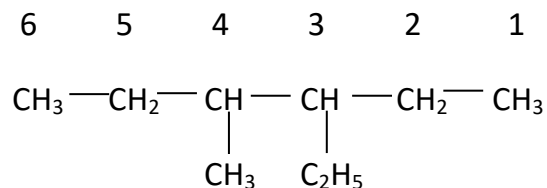


3- Ethyl hexane.

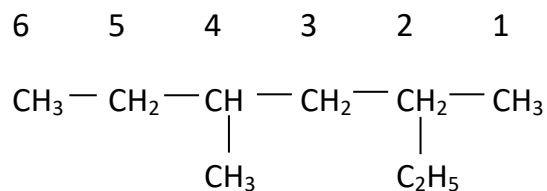
Not 3- Propyl Pentane.

<b>Naming the different substituents of equivalent positions:-

If two different substituents are present at equivalent positions from the two ends of the parent chain, then the numbering of the chain is done in such a way that the substituents which comes first in the alphabetical order gets the lower number. ex:-



3- Ethyl – 4-methyl hexane



2-Ethyl-5-methyl hexane

<c>Rule for branched substituent in the chain(lowest sum rule) :-

If the chain contains more than one branch then count the chain in such a direction that sum of their position will be lowest one.

Ex:-2, 2, 4 – Trimethyl pentane.

Alkene :

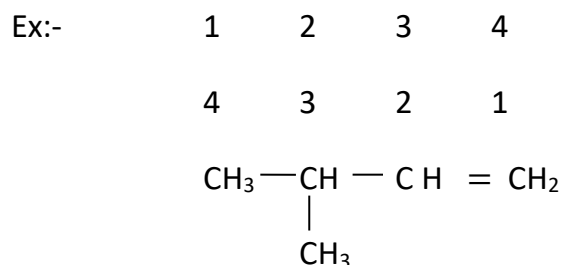
Alkene with general formula  $\text{C}_n\text{H}_{2n}$  and suffix – ene, n = no. of carbon atom and 2,3,4.....'n' can't be one.

n=2,  $\text{C}_2\text{H}_4$  = Ethene

n=3,  $\text{C}_3\text{H}_6$  = Propene

n= 4,  $\text{C}_4\text{H}_8$  = Butene

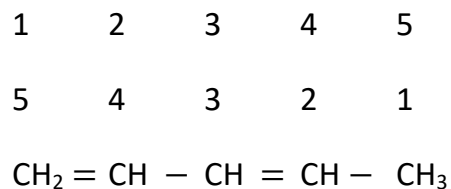
Rule – 1 : The chain contains = bond and branch. '=' bond is prefer to branch.



## 3-Methyl bute-1-ene

Rule - 2 :

Chain containing more than one '=' bond is termed as diene, triene for 2, 3 = bonds. The position of the '=' bond follows lowest, sum rule.



Penta-1,3-diene

**Alkyne:**

Rule – 1:

General formula  $\text{C}_n\text{H}_{2n-2}$  and suffix -yne, where  $n = 2,3,4,5$  etc.

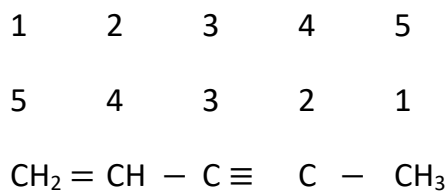
If	$n = 2$	Ethyne
	$n = 3$	Propyne
	$n = 4$	Butyne

Rule – 2 : Chain containing double &amp; triple bond

**Lowest sum Rule:**

- a) Sum of the position of the double and triple bond must be lowest.

Naming first 'en' then 'yne' is written. eg –

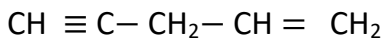


Pent-1-en-3-yne

- b) In case of identical sum double bond is preferred to triple bond

1    2    3    4    5

5    4    3    2    1



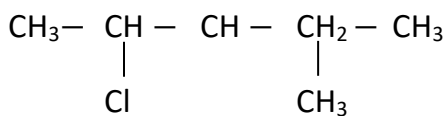
Pent-1-en-4-yne

### Alkyl Halide:

Halogen is treated as a prefix and the prefixes are to be arranged alphabetically obeying lowest sum rule.

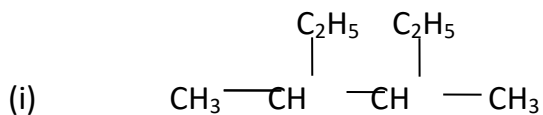
1    2    3    4    5

5    4    3    2    1

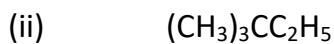


Ex :- 2-Chloro-4-methyl Pentane

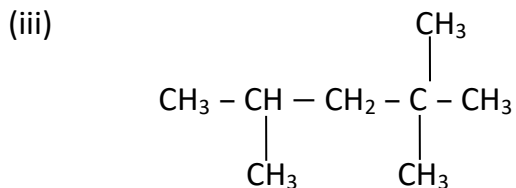
### Practice:-



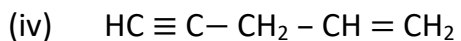
2-Ethyl - 3 -Methyl pentane.



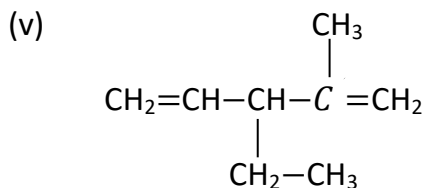
2,2- Dimethyl butane.



2,2,4 - Trimethyl pentne.



Pent - 1 - en - 4 - yne



3- Ethyl – 2- Methyl penta – 1,4-diene

**ALCOHOL (ROH):**

It is having suffix- 'ol'.

GENERAL NAME	GENERAL FORMULA	EXAMPLE
Alkanol	$\text{C}_n\text{H}_{2n+1}\text{OH} / \text{C}_n\text{H}_{2n+2}\text{O}$	If n=1, $\text{CH}_3\text{-OH}$ (methanol) n=2, $\text{CH}_3\text{-CH}_2\text{-OH}$ (ethanol) n=3, $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$ (propan-1-ol)
Alkenol	$\text{C}_n\text{H}_{2n}\text{O}$	If n=2, $\text{CH}_2=\text{CH-OH}$ (ethenol) n=3, $\text{CH}_2=\text{CH-CH}_2\text{-OH}$ (prop-2-en-1-ol) $\text{CH}_2=\text{CH-CH}_3$ (prop-1-en-2-ol)   OH
Alkyne	$\text{C}_n\text{H}_{2n-2}\text{O}$	If n=2, $\text{HC}\equiv\text{C-OH}$ (ethynol) n=3, $\text{CH}\equiv\text{C}_2\text{-CH}_2\text{-OH}$ (prop-2-yn-1-ol)

**Uses of hydrocarbon in daily life:****BENZENE is used-**

- in dry cleaning.
- as a motor fuel when mixed with petrol.
- as a solvent.
- as an insecticide (as gamma-xylene is prepared from it).
- as a starting material for the preparation of dyes, drugs, plastics, insecticides.

**Toluene is used-**

- as a substitute of petrol.
- in the manufacture of certain dyes and drugs
- an industrial solvent and in dry cleaning.

**Phenol is used-**

- as an antiseptic in soaps, lotions and ointments.
- as a preservative for ink.
- in the preparation of fungicides & bactericides.

**Naphthalene is used-**

- for manufacture of dyes, explosives and synthetic resins.
- for commercial production of phthalic anhydride,  $\alpha$ -naphthol,  $\beta$ -naphthol
- for increasing the illuminating power of coal gas.

**Anthracene is used-**

- for manufacture of anthraquinone
- for making (alizarine)
- in smoke screens.

**Benzoic acid is used-**

- in the treatment of skin diseases like eczema
  - as medicine especially as urinary antiseptic in the form of its salt.
  - in the preparation of aniline blue
-