ORGANIC CHEMISTRY

Hydrocarbons:- The compounds containing Carbon and hydrogen are called hydrocarbons.

**Saturated hydrocarbons:-** These are the hydrocarbons containing $C-C$ single bond only.

Ex- Alkane

Unsaturated hydrocarbons:- These are the hydrocarbons containing $C-C$ multiple bonds. ($C=C$, $C\equiv C$)

Ex- Alkenes, Alkynes

Aliphatic hydrocarbons: Open chain hydrocarbons are called aliphatic hydrocarbons or acyclic hydrocarbons. Straight chain or branched chain.

Ex- $CH_3-CH_2-CH_2-CH_3$ $CH_3-CH-CH_2-CH_3$

(n-butane) CH_3

                              (2-Methyl butane)
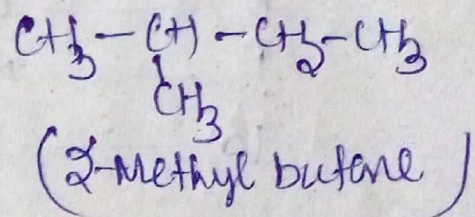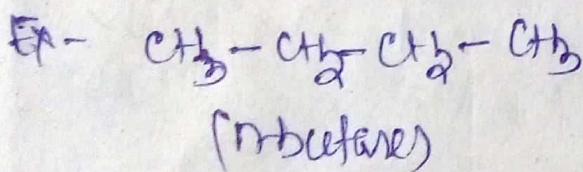
Aromatic hydrocarbons: The hydrocarbons which obey Huckel's rule of aromaticity.
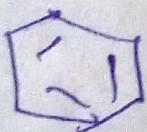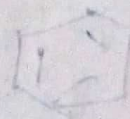
Benzene (C_6H_6)

IUPAC System of Nomenclature

LUPAC - International Chiun of Pure and Applied chemistry

1. Root word :-

No. of C	Root word
1	Meth
2	Eth
3	Prop
4	But
5	pent
6	Hex
7	Hept
8	Oct
9	Non
10	Dec

2. Prefix

Group	Prefix
-F	-Fluoro
-Cl	chloro
-Br	Bromo
-I	Iodo
$-NO_2$	Nitro
-R	alkyl
-OR	alkoxy

Class of compounds

1. Alkanes : Hydrocarbons having c-c single bond.

General formula: C_nH_{2n+2} $n = 1, 2, 3 \cdots$
IUPAC: word root + ane

Formula	Common name	IUPAC name
CH_4	Methane	Methane
C_2H_6	Ethane	Ethane
C_3H_8	Propane	Propane

2. Alkenes : Hydrocarbons having c-c double bond.

General formula: C_nH_{2n} $n = 2, 3, 4 \cdots$
IUPAC: word root + ene

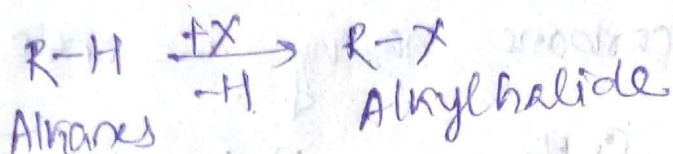| Formula	Common name	IUPAC name
C_2H_4	Ethylene	Ethene
C_3H_6	Propylene	Propene
C_4H_8	Butylene	Butene

3. Alkynes :- Hydrocarbons having c-c triple bond.

General formula: C_nH_{2n-2} $n = 2, 3, 4 \cdots$
IUPAC: word root + yne

Formula	Common name	IUPAC name
C_2H_2	Acetylene	Ethyne
C_3H_4	Propyne	Propyne
C_4H_6	Butyne	Butyne

4. Alkyl halides or haloalkanes

$$R-H \xrightarrow[-H]{+X} R-X$$

Alkanes → Alkyl halide

$X =$ halogen (F, Cl, Br, I)

Formula	Common name	IUPAC name
CH_3-Br	Methyl bromide	Bromomethane
C_2H_5-Br	Ethyl bromide	Bromoethane

5. Alcohols (OH)

Hydrocarbons containing $-OH$ gr. in their molecule are called alcohols.

$$R-H \xrightarrow[-H]{+OH} R-OH$$

Alkane → Alcohols
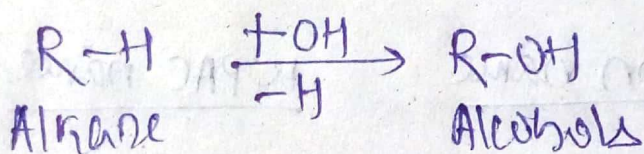
General formula: $C_nH_{2n+1}OH$ or $C_nH_{2n+2}O$

IUPAC - Alkanol

Formula	Common name	IUPAC name
CH_3OH	Methyl alcohol	Methanol
C_2H_5OH	Ethyl alcohol	Ethanol

Rules For Iupac System of Nomenclature

1. Expansion of chain : sometimes condensed groups are present in organic compounds. These go to be separated.
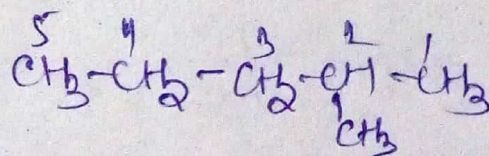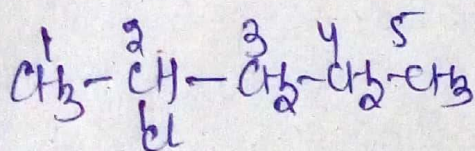
$$(CH_3)_3 CH-CH_3 \longrightarrow CH_3-\overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}}-CH_3$$
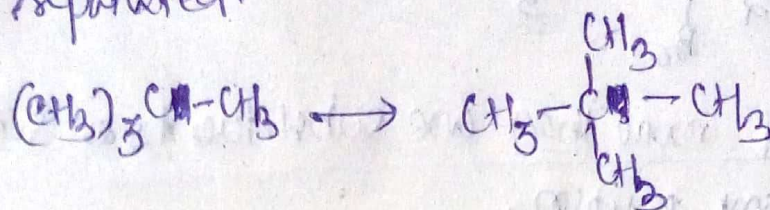
2. Selection of parent chain : The longest continuous C-chain is called parent chain.

$$CH_3-CH_2-CH-CH_3$$
$$|$$
$$CH_2-CH_3 \longleftarrow \text{Parent chain}$$
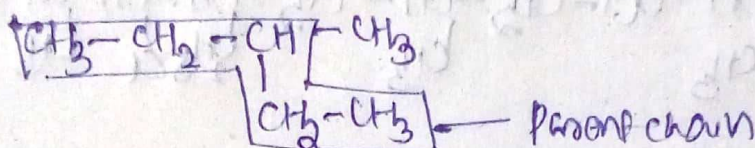
3. Numbering of carbon : After selecting the parent chain carbon atoms of the chain are numbered.

a. Presence of one substituent (F, Cl, Br, NO₂ etc.) on one side chain :

if a compound contains a substituent or a side chain then minimum no. is given to carbon containing substituent on side chain.

$$\overset{1}{C}H_3-\overset{2}{C}H-\overset{3}{C}H_2-\overset{4}{C}H_2-\overset{5}{C}H_3 \qquad \overset{5}{C}H_3-\overset{4}{C}H_2-\overset{3}{C}H_2-\overset{2}{C}H-\overset{1}{C}H_3$$
$$\quad\; | \qquad\qquad\qquad\qquad\qquad\qquad\qquad\; |$$
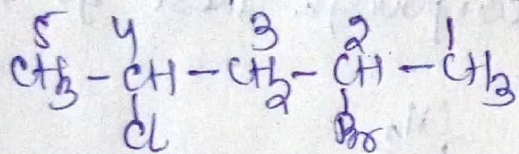$$\quad\; Cl \qquad\qquad\qquad\qquad\qquad\qquad\quad\; CH_3$$

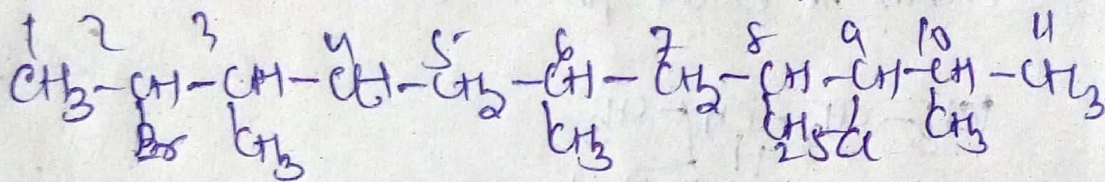**b. Presence of 1 substituent or 1 side chain at same position minimum no. is given to carbon containing substituent.**

$$\overset{2}{C}H_3-\overset{3}{C}H-\overset{4}{C}H_2-\overset{5}{C}H-\overset{5}{C}H_3$$
$$\qquad | \qquad\qquad\quad |$$
$$\qquad CH_3 \qquad\qquad CH_3$$
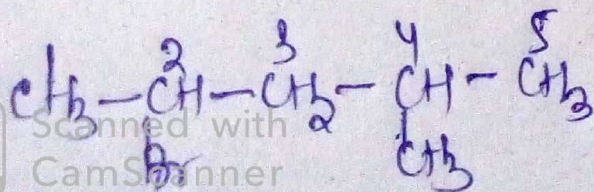
c. Presence of two substituents at same position from either end:

alphabetical order is considered.

$$\overset{5}{C}H_3-\overset{4}{C}H-\overset{3}{C}H_2-\overset{2}{C}H-\overset{1}{C}H_3$$
$$\quad\quad\;\; |\quad\quad\quad\;\; |$$
$$\quad\quad\; Cl\quad\quad\;\; Br$$

d. Presence of more than one substituents or same chain at any position.

Lowest locants rule is followed.

$$\overset{1}{C}H_3-\overset{2}{C}H-\overset{3}{C}H-\overset{4}{C}H-\overset{5}{C}H_2-\overset{6}{C}H-\overset{7}{C}H_2-\overset{8}{C}H-\overset{9}{C}H-\overset{10}{C}H-\overset{11}{C}H_3$$
$$\quad\quad\;\; |\quad\;\; |\quad\quad\;\; |\quad\quad\quad\quad\;\; |\quad\quad\;\; |\quad\; |$$
$$\quad\quad Br\;\; CH_3\quad\quad CH_3\quad\quad\quad C_2H_5Cl\;\; CH_3$$

e. Presence of multiple bonds:

If a compound contains a multiple bond $(C=C$ or $C\equiv C)$, then minimum number is given to the carbon containing multiple bond.

$$\overset{5}{C}H_3-\overset{4}{C}H_2-\overset{3}{C}H-\overset{2}{C}H=\overset{1}{C}H_2$$
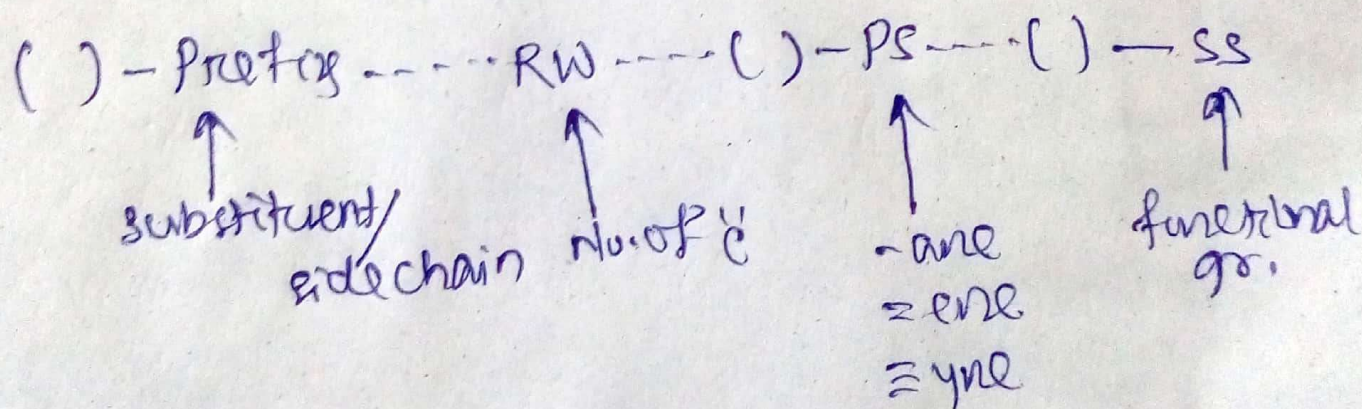$$\quad\quad\quad\quad\quad\; |$$
$$\quad\quad\quad\quad\; CH_3$$
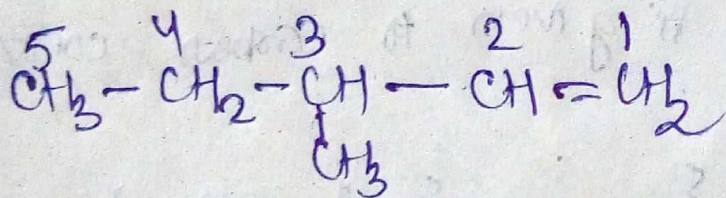
① If a compound contains more than one double or triple bond, then lowest locant rule is followed. If they are at the same position from either end, then c-atom containing double bond is given minimum number.
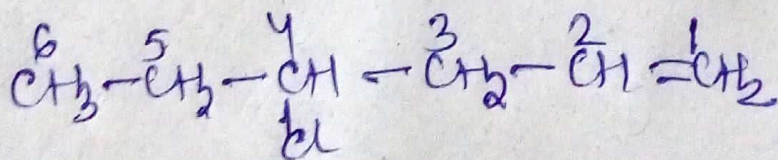
② If a compound contains both double (=) and triple (≡) bonds, then the compound is named as -en-yne.

4. **Arrangement of Root word, Prefix, Primary suffix and secondary suffix:**

In an organic compound the RW, Prefix, PS and SS are arranged in the following way —

( ) — Prefix ----- RW ---- ( ) — PS ---- ( ) — SS

    ↑   ↑   ↑   ↑

substituent/   No. of C   -ane   functional
side chain   =ene   gr.
                            ≡yne

Ex-

$$\overset{6}{C}H_3 - \overset{5}{C}H_2 - \overset{4}{C}H - \overset{3}{C}H_2 - \overset{2}{C}H = \overset{1}{C}H_2$$
                |
                Cl

4-chloro hex-1-ene

5. **Rules for alphabetical order:** If a compound contains more than 1 substituent/side chains, then while naming the substituent/side chains are arranged alphabetically. while following the rules for alphabetical order the prefixes like di, tri, tetra etc. are ignored.