

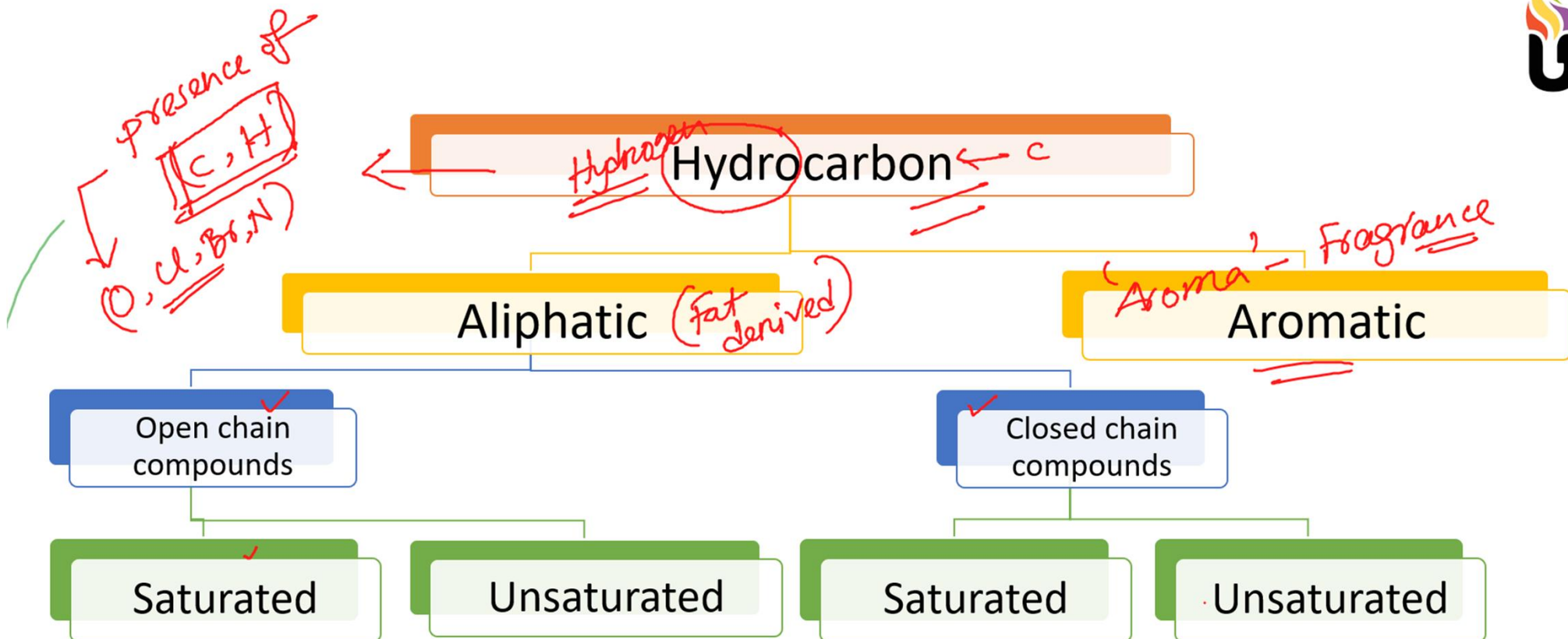


Class X Academic Program -2020

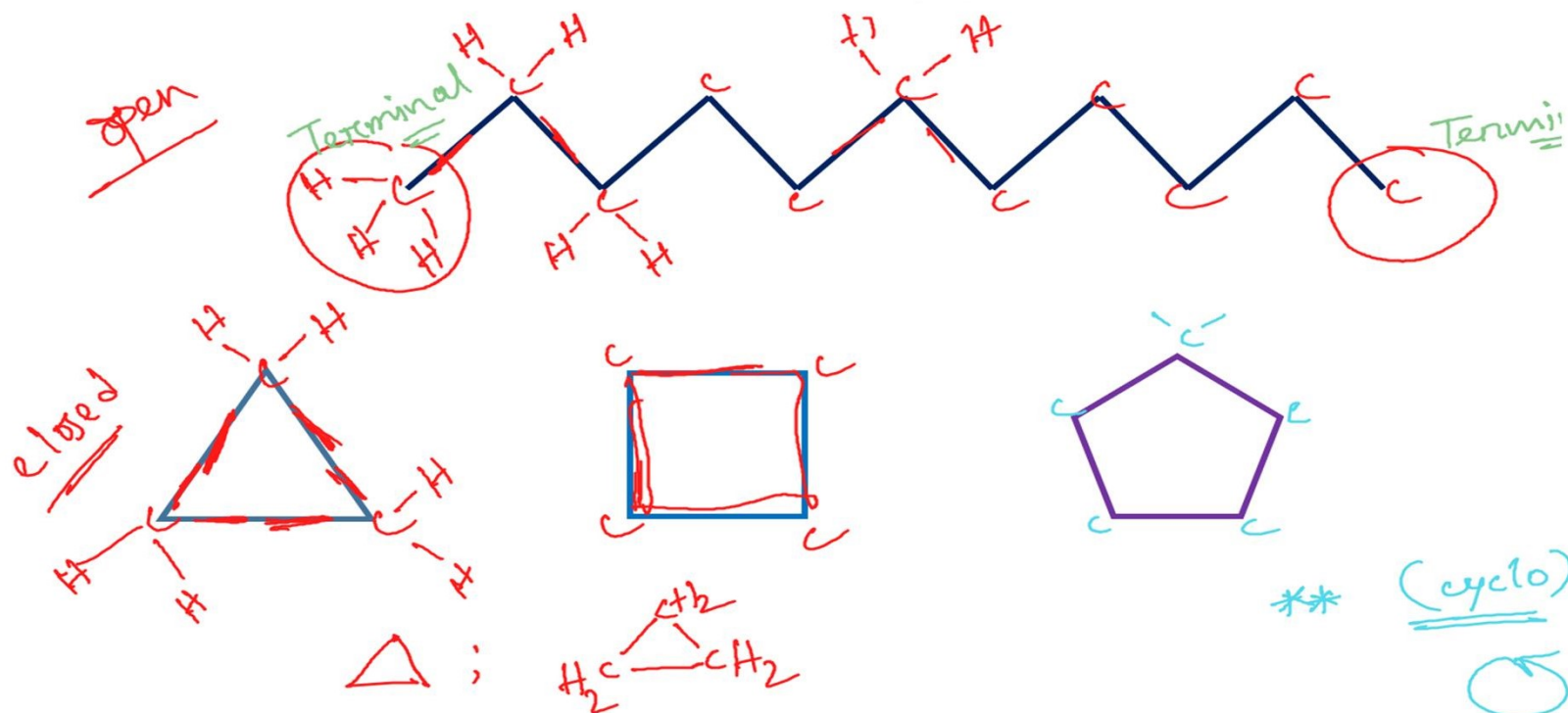
Chemistry (C-29)

Lecture 02

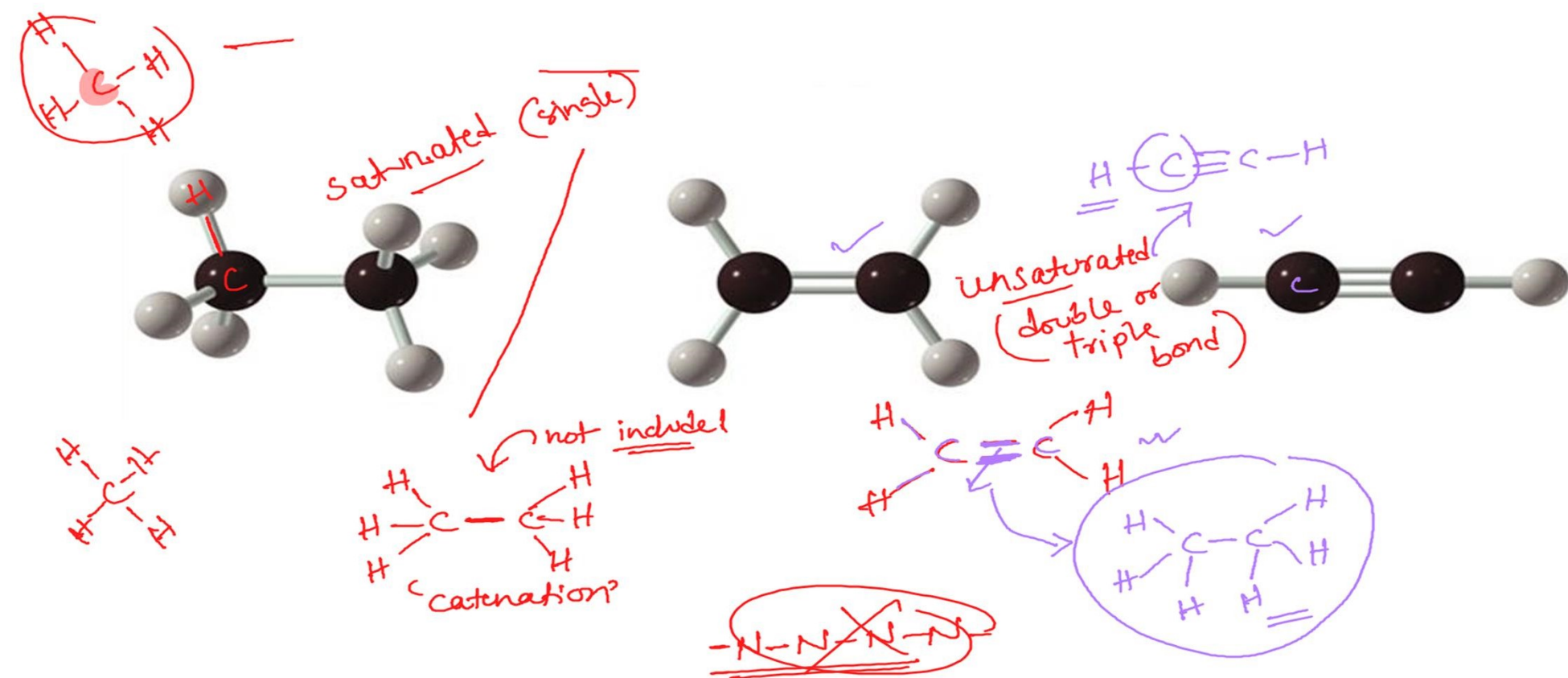
Instructor : Md. Shafiqul Islam Nibir



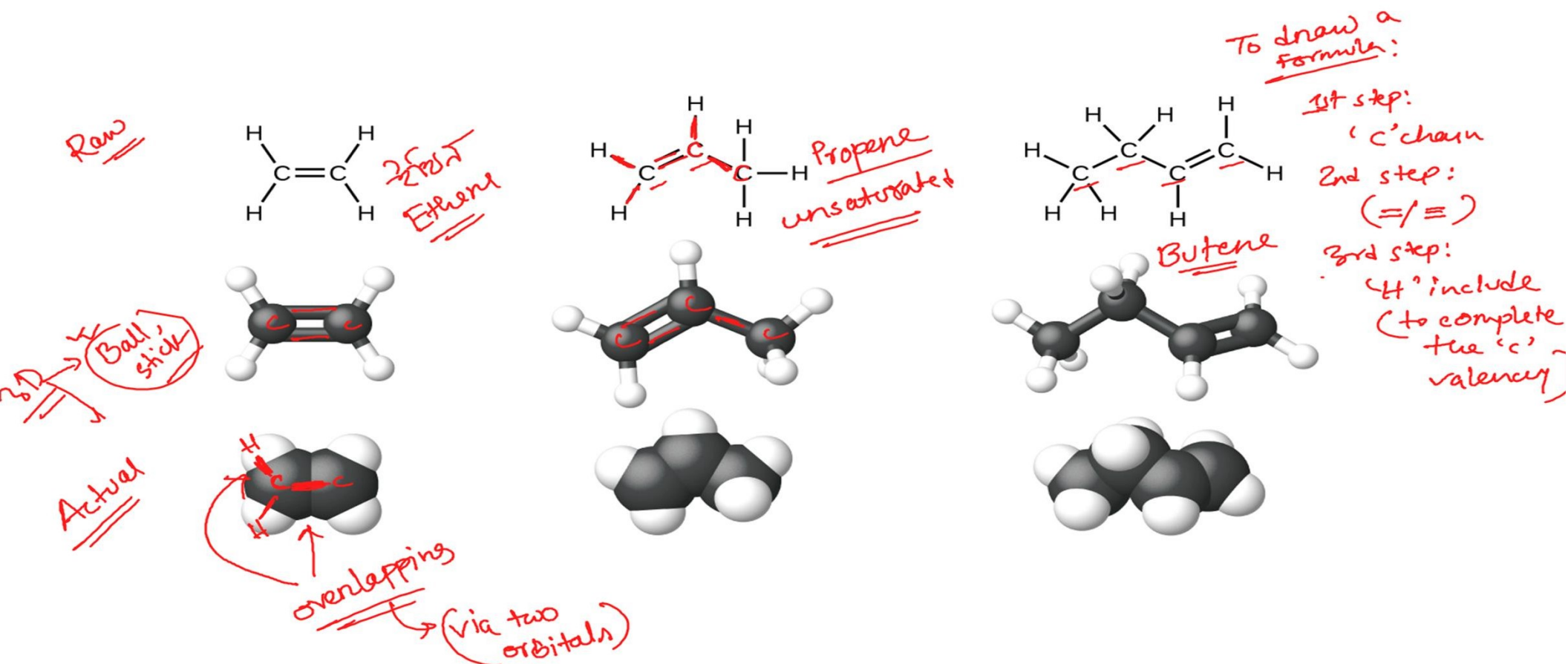
Open & Closed chain hydrocarbons



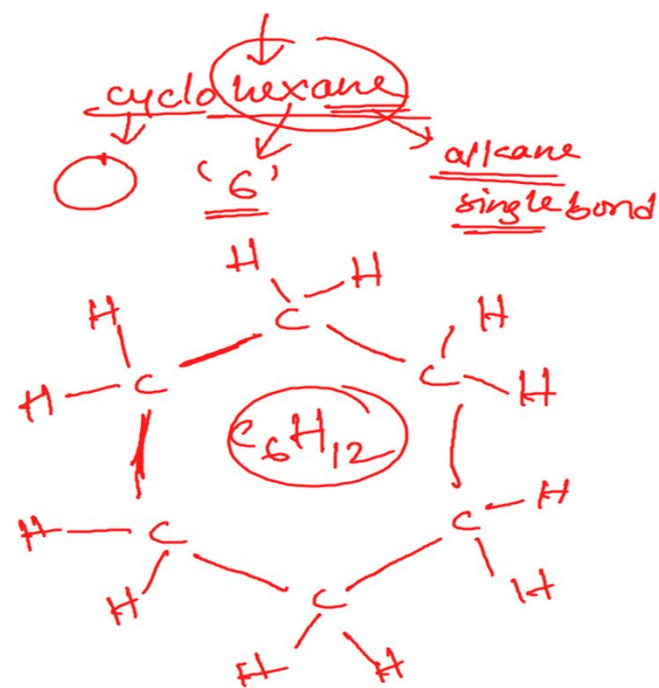
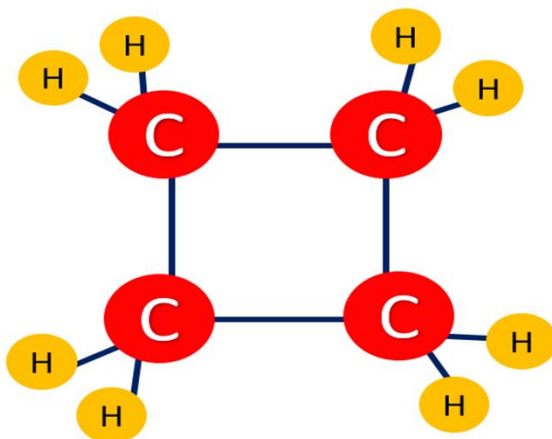
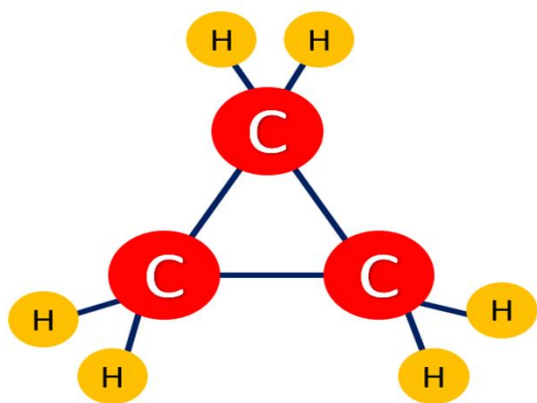
Saturated & Unsaturated Hydrocarbon



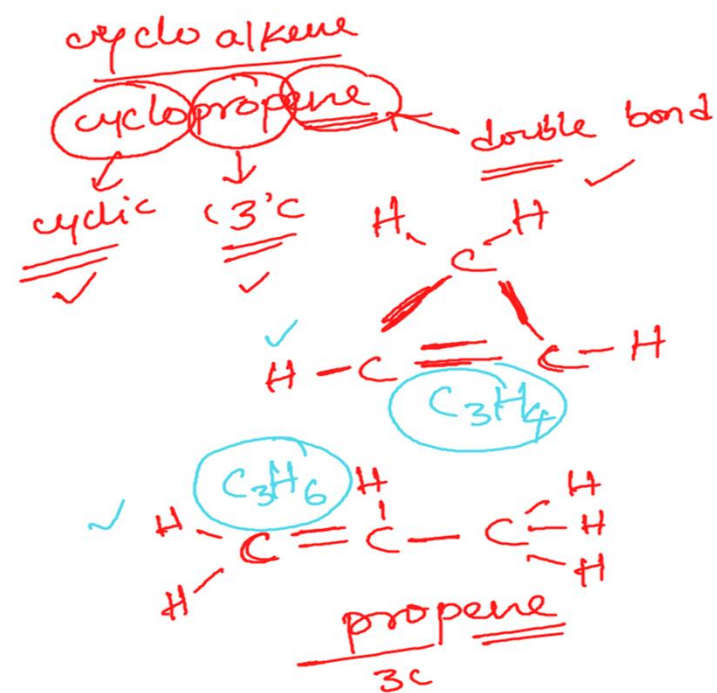
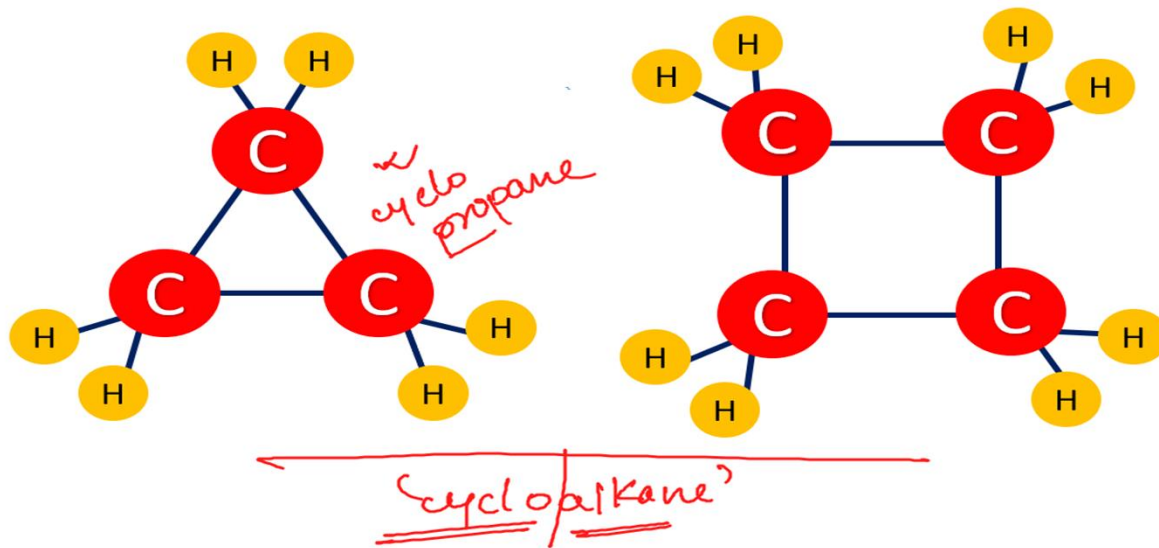
Saturated & Unsaturated Hydrocarbon



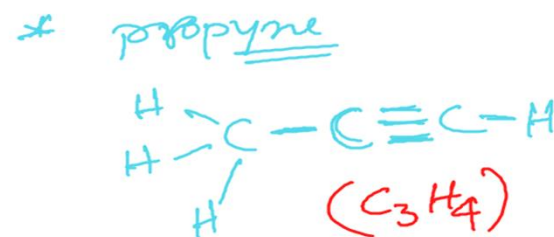
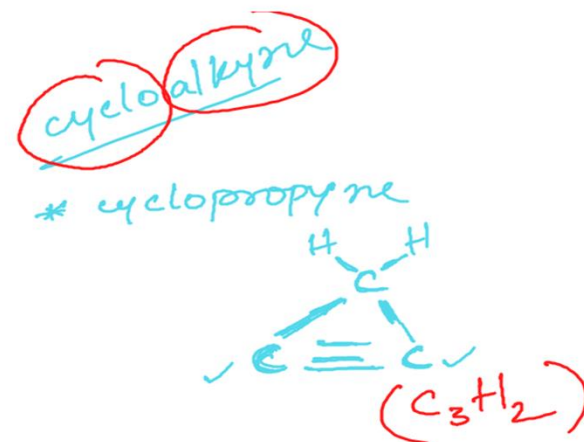
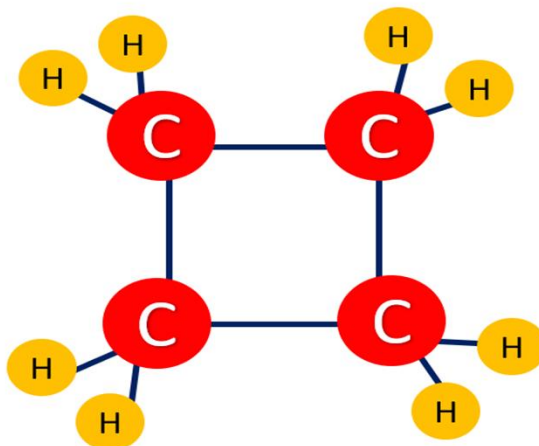
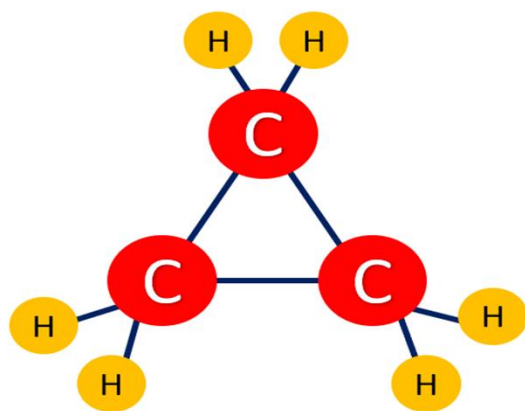
Saturated Closed chain hydrocarbons



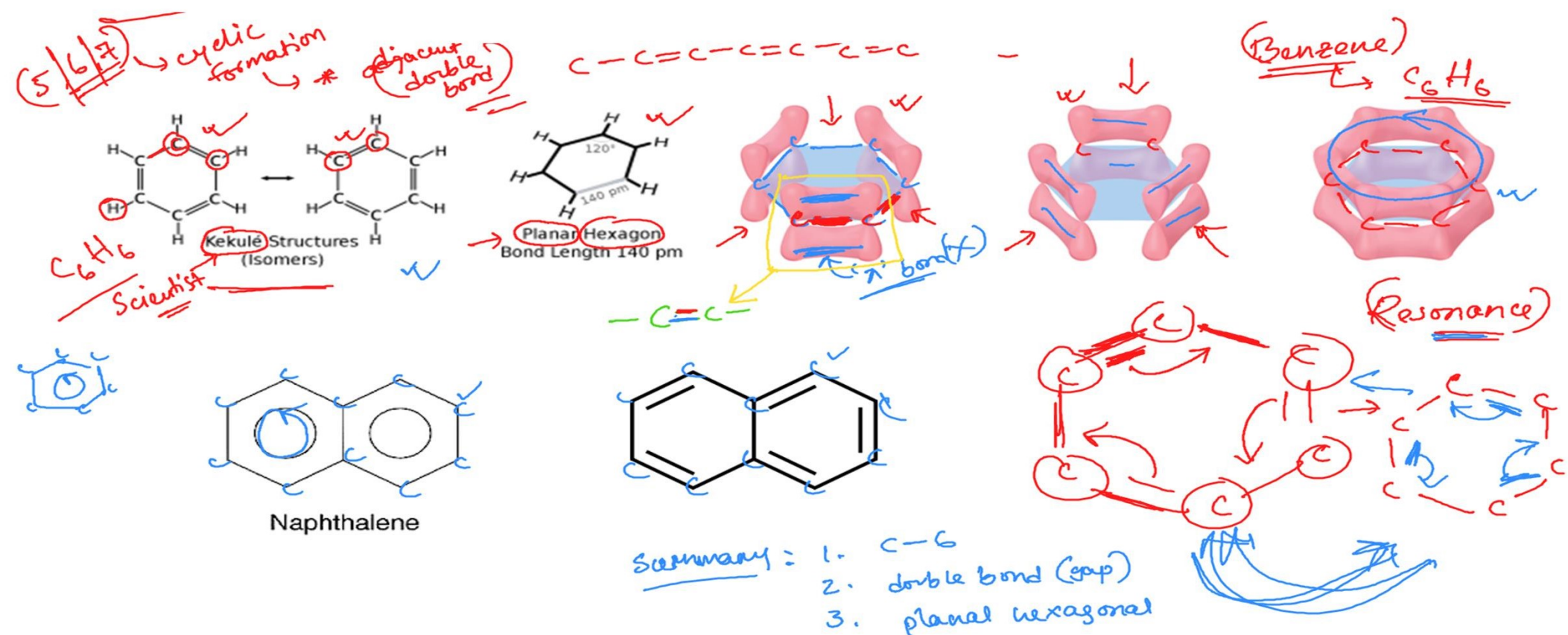
Saturated Closed chain hydrocarbons



Saturated Closed chain hydrocarbons



Aromatic Hydrocarbon

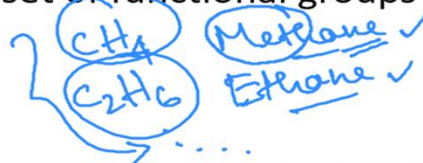




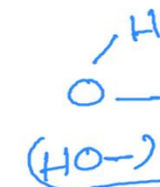
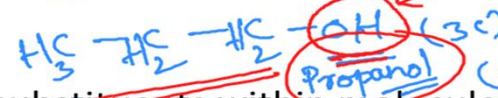
Homologous Series & Functional Group

In the field of organic chemistry, a **homologous series** is a sequence of compounds with the same functional group and similar chemical properties in which the members of the series can be branched or unbranched. Compounds within a homologous series typically have a fixed set of functional groups that gives them similar chemical and physical properties.

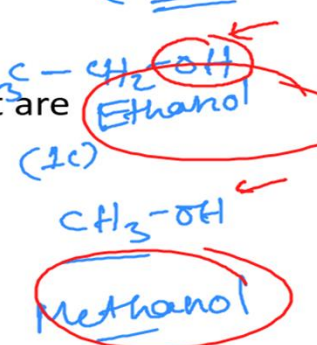
For example:
Alkane
single bond



Alcohol → (-OH) hydroxyl group



In organic chemistry, **functional groups** are specific substituents within molecules that are responsible for the characteristic chemical reactions of those molecules.



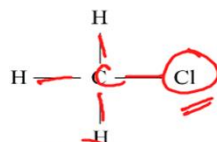


Homologous Series & Functional Group

Characteristics of Homologous Series

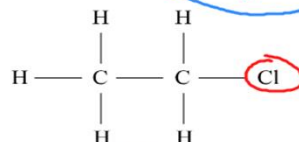
1. Structural Formula : Alkane :

Halogen
Alkane
Halo Alkane

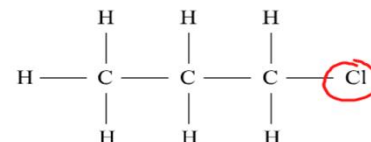


ক্লোরো মিথেন

Chloro Methane



ক্লোরো ইথেন



ক্লোরো প্রোপেন

$n=1$; CH_4 (Methane)

$n=2$; C_2H_6 (Ethane)

$n=3$; C_3H_8 (Propane)

$n=1$; $\text{H}=4$
 $n=2$; $\text{H}=6$
 $n=3$; $\text{H}=8$
 $+2+2$

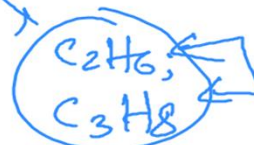
$\text{C}_n\text{H}_{2n+2}$

General formula of alkane

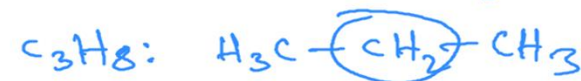
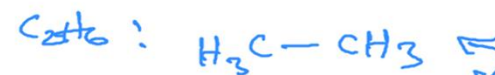
2. Molecular Formula : Adjacent members differ from each other by (-CH₂-) unit

(Methylene) group

-CH₂-



-CH₂-

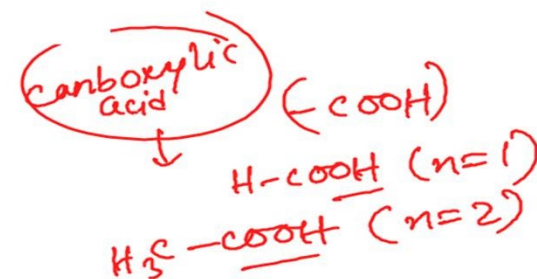
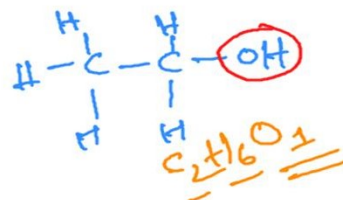
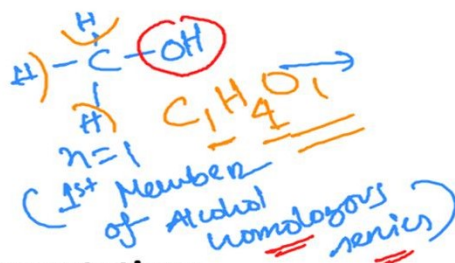


Homologous Series & Functional Group



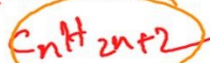
3. Same Functional

Alcohol:
 $(-OH)$



4. General Formula of Representation:

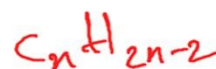
Alkane:



Alkene:



Alkyne:

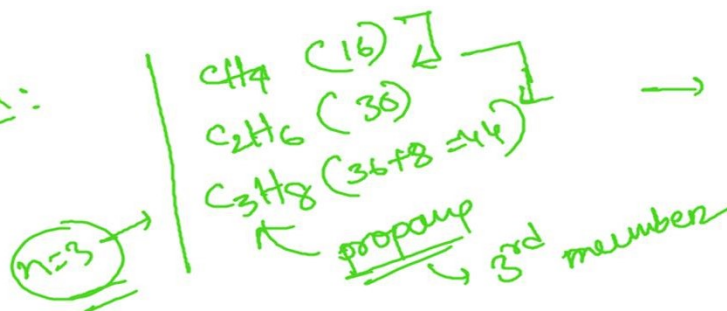


Alcohol:



5. Molecular Mass:

Alkane:



$n=100^{\text{th}}$

$$(12 \times 100) + (2 \times 100 + 2) \times 1$$

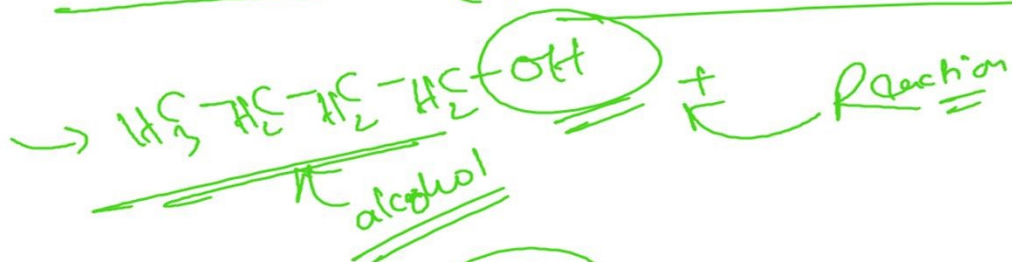
$$1200 + 202 = 1402$$

$$\begin{aligned} & (12 \times n) + (2n+2) \times 1 \\ &= 12 \times 3 + (6+2) \times 1 \\ &= 36 + 8 = 44 \end{aligned}$$



Homologous Series & Functional Group

6. Same chemical properties (because of having same functional group)



7. Same general method of preparation

- Alkane
- Alkene
- Alkyne
- Alcohol
- Aldehyde



Homologous Series & Functional Group

- ☒ Alkane (C_nH_{2n+2}) ... (single bond) $CH_4 \xrightarrow{-1H} (H_3C-)$ methyl group
- ☒ Alkene (C_nH_{2n}) ... (double bond) methane $\xrightarrow{-1H}$ alkene $\xrightarrow{-1H} (R-)$ alkyl group
- ☐ Alkyne (C_nH_{2n-2}) ... (triple bond) $\uparrow \rightarrow (C_nH_{2n+1})$
- ☒ Alcohol $(R-OH)$ $(R) H_3C-OH$: $(C_nH_{2n+2}O)$: (OH) is the functional group.
- ☒ Aldehyde $(R-\overset{O}{\parallel}C-H)$: $(-CHO) \leftarrow \overset{O}{\parallel}C-H$ $(H) \overset{O}{\parallel}C-H$ (n=1) Methanaldehyde
- ☒ Carboxylic acid (-oic acid) $(C_nH_{2n}O_2)$ $(C_nH_{2n}O_2) \leftarrow \overset{O}{\parallel}C-O-H$

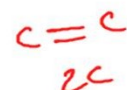
$C=1, H=2, O=2$
 $H-COOH$ (methanoic acid)
 CH_3-COOH (ethanoic acid)
 $C=2, O=2, H=4$
 $G.F.: C_nH_{2n}O_2$

$(C=2, H=4)$
 CH_3-CHO (n=2) ethanaldehyde
 $G.F.: C_nH_{2n}O$



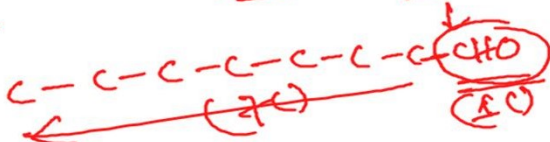
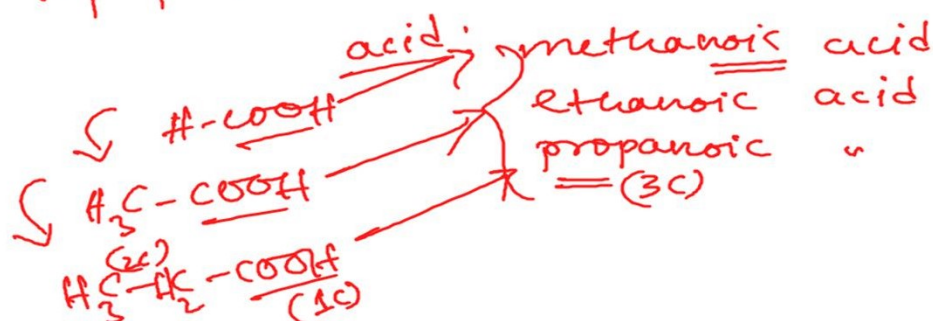
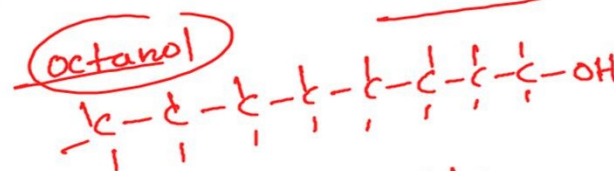
Homologous Series & Functional Group

- ☐ Alkane
↳ 1C
 - ☐ Alkene
↳ 2C
 - ☐ Alkyne
↳ 2C
 - ☐ Alcohol
↳ 1C
 - ☐ Aldehyde
↳ 1C (-CHO)
 - ☐ Carboxylic acid (-oic acid)
↳ 1C
- 1C → meth
 2C → eth
 3C → prop
 4C → but
 5C → pent
 6C → hex
 7C → hept
 8C → oct
 9C → non
 10C → dec



alcohol : methanol
ethanol
propanol

aldehyde : methanaldehyde
- (methanal)
- ethanal
- propanal



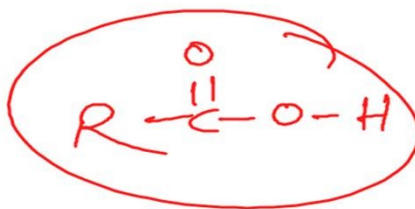
8C
 *octanal



Homologous Series & Functional Group

- ☐ Alkane
- ☐ Alkene
- ☐ Alkyne
- ☐ Alcohol
- ☐ Aldehyde
- ☐ Carboxylic acid (-oic acid)

$\text{H}-\text{COOH}$ methanoic acid
 CH_3-COOH ethanoic "
 $\text{C}-\text{C}-\text{COOH}$ propanoic "



Nomenclature of Organic Compounds



There are 3 ways.....

(i) General

(ii) Derived

(iii) **IUPAC**



Nomenclature of Organic Compounds

There are 3 terms or parts in IUPAC system -

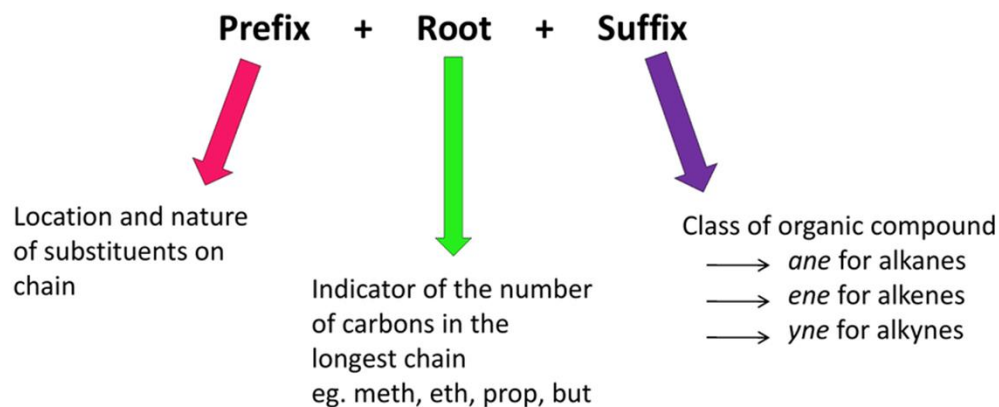
01. Prefix

02. Stem

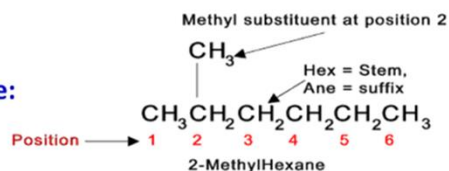
03. Suffix

Review of Naming Hydrocarbons

Based on the longest carbon chain in the compound



Example:



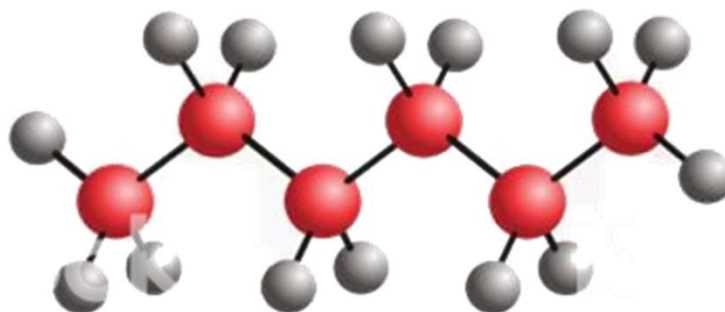
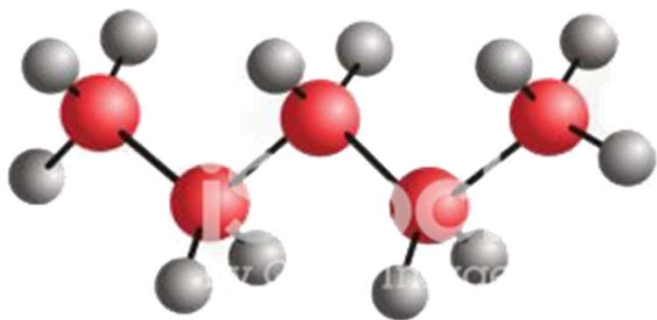
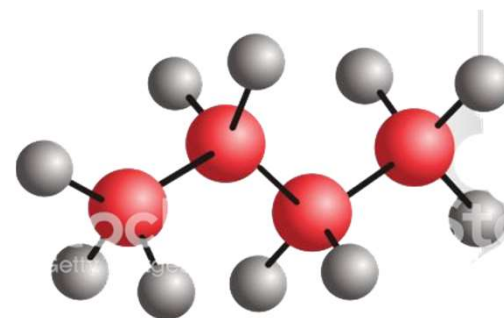
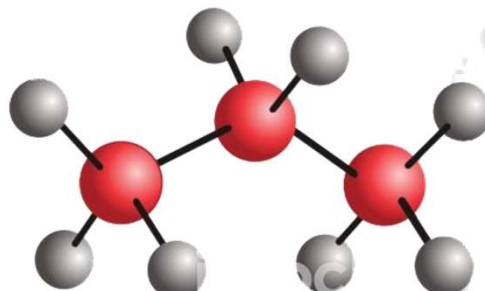
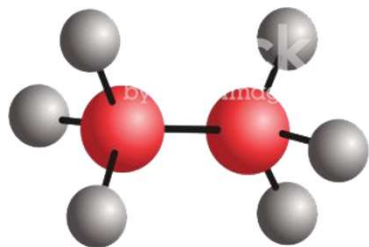
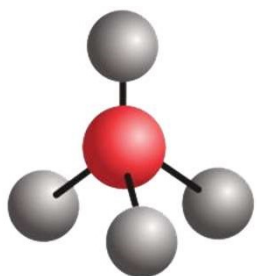
Nomenclature of Organic Compounds



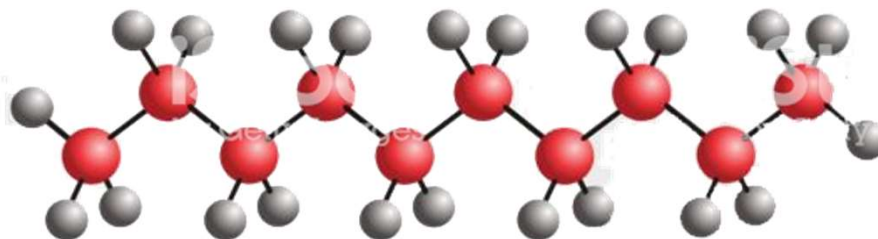
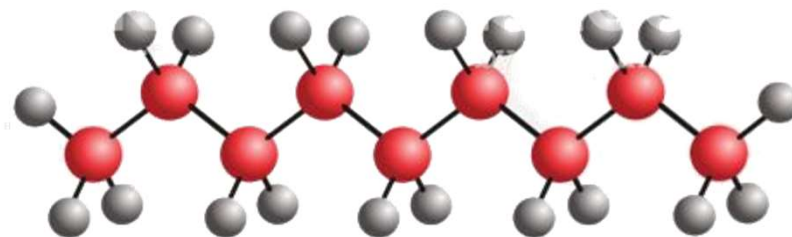
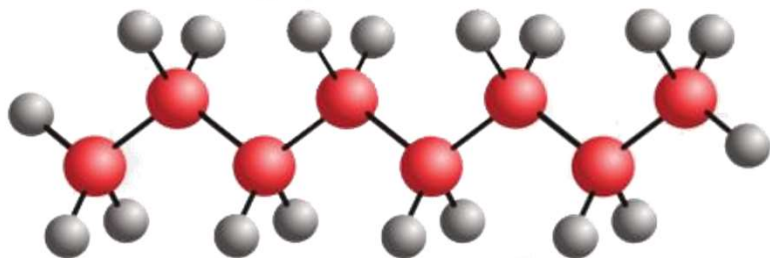
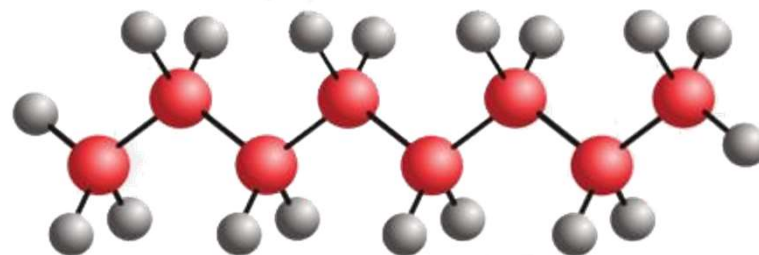
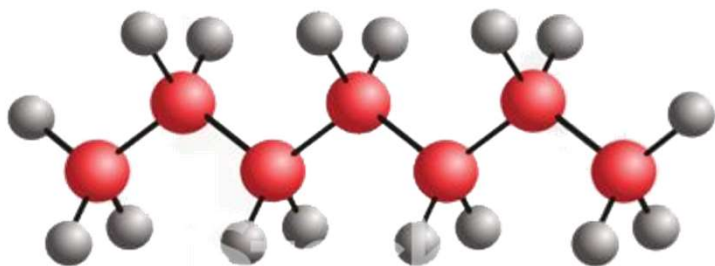
শিকলের C পরমাণু
C ₁
C ₂
C ₃
C ₄
C ₅
C ₆
C ₇
C ₈
C ₉
C ₁₀

- | | |
|-------------------------|-------------------------|
| • <i>Meth-</i> 1 carbon | • <i>Hept-</i> 7 carbon |
| • <i>Eth-</i> 2 carbon | • <i>Oct-</i> 8 carbon |
| • <i>Prop-</i> 3 carbon | • <i>Non-</i> 9 carbon |
| • <i>But-</i> 4 carbon | • <i>Dec-</i> 10 carbon |
| • <i>Pent-</i> 5 carbon | |
| • <i>Hex-</i> 6 carbon | |

Nomenclature of Alkane



Nomenclature of Alkane





Nomenclature of Organic Compounds

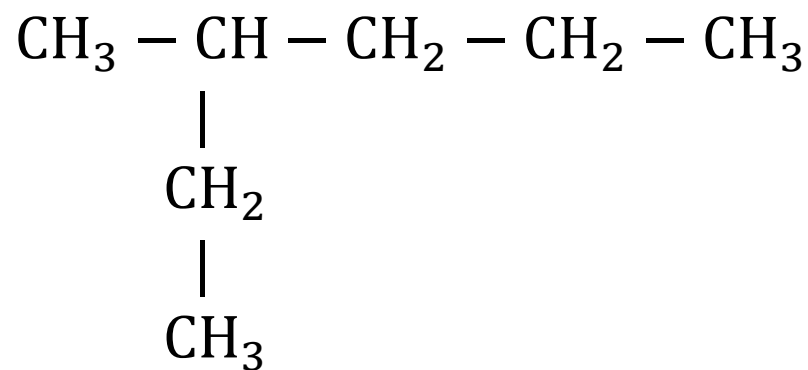
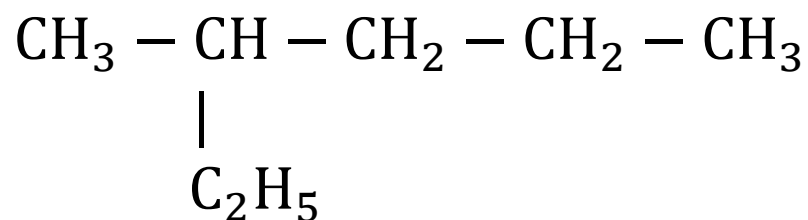
- ☐ Heptane
- ☐ Butene
- ☐ Ethyne
- ☐ Propanol
- ☐ Hexanoic Acid
- ☐ Pentanal



Nomenclature of Organic Compounds

Characteristics of Main Chain

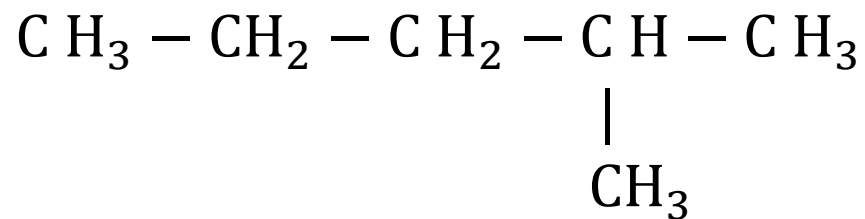
- ☐ C-C chain
- ☐ The Longest
- ☐ Presence of Functional Group





Nomenclature of Organic Compounds

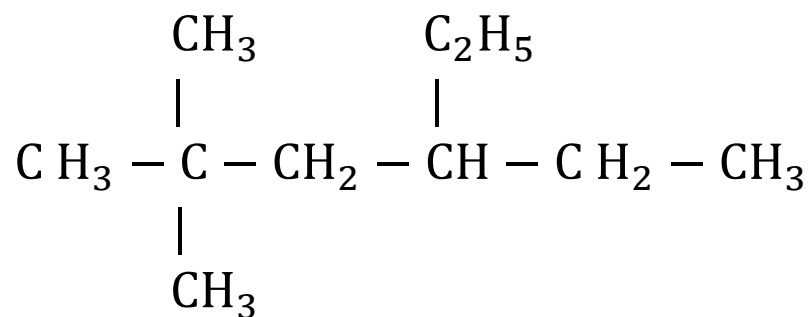
- The Numbering process in case of side chain





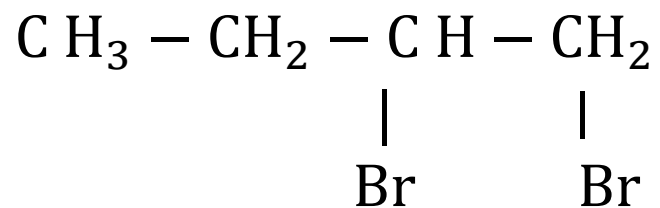
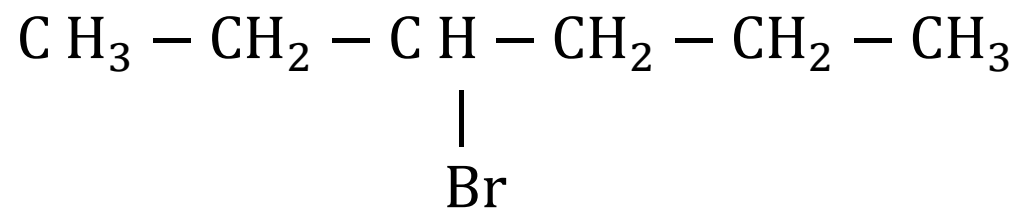
Nomenclature of Organic Compounds

- ☐ If there presents more than one side chain, then ?
- ☐ Hyphen (-) in between number & word
- ☐ Comma (,) in between numbers
- ☐ If there presents same side chain more than one time, then ?





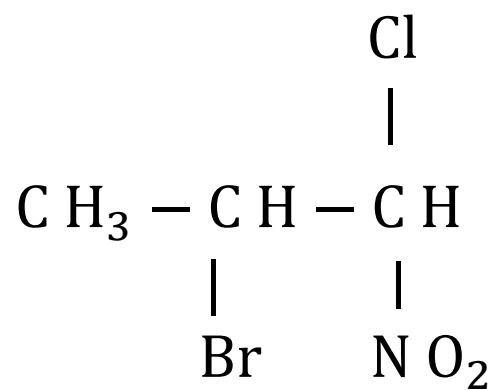
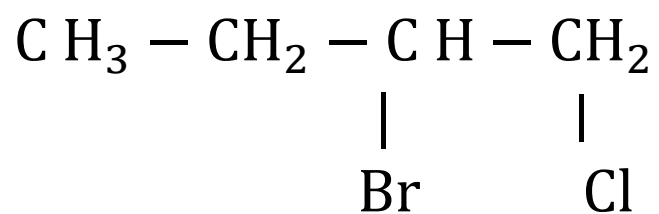
Nomenclature of Organic Compounds





Nomenclature of Organic Compounds

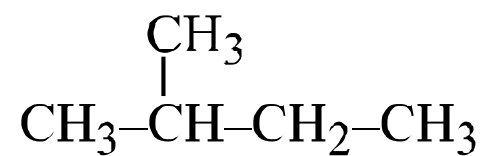
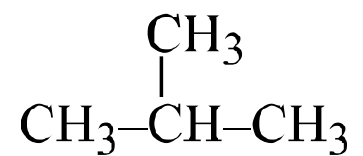
- Alphabetical approach



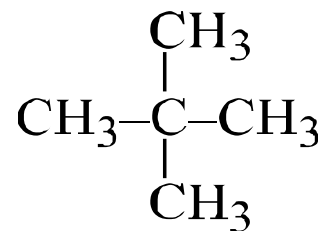
Nomenclature of Organic Compounds



Introduction to **ISO-** & **NEO-** formation



1



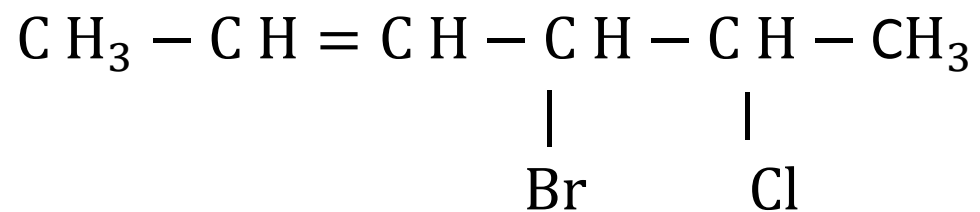
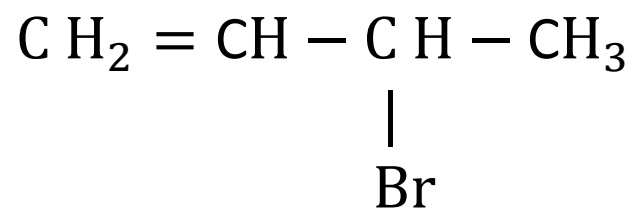
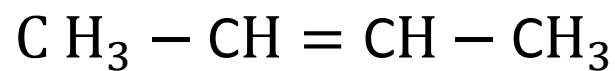
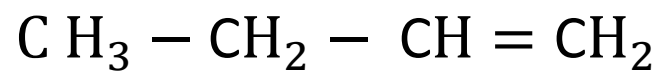


From Nomenclature to Formula

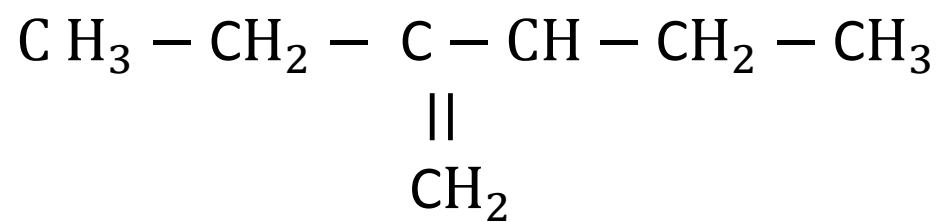
2,2-Dibromo-3-Methyl Pentane

1,2,3,4-Tetrachloro-3-nitro Heptane

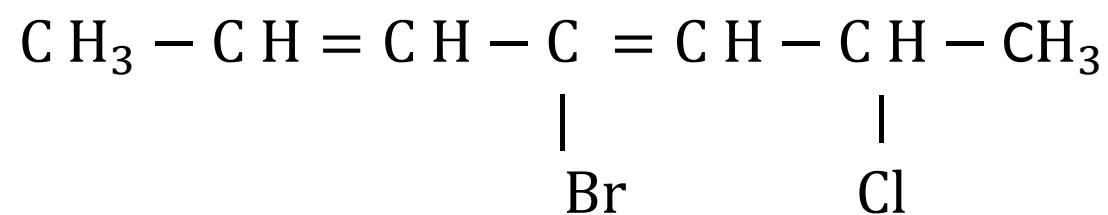
Nomenclature of Alkene



Nomenclature of Alkene

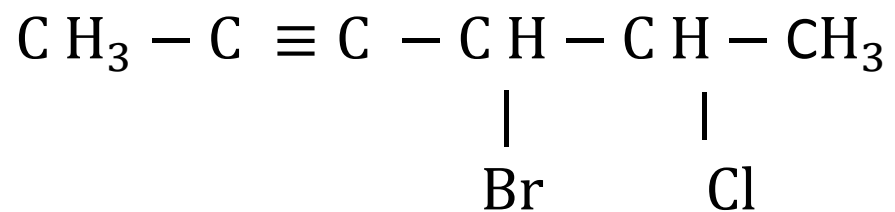
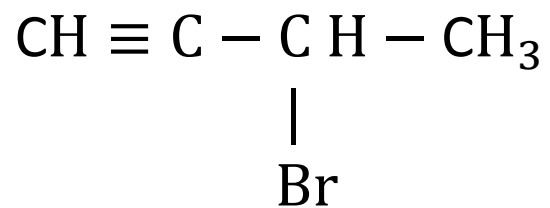
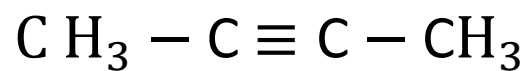
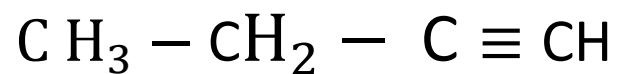


Nomenclature of Alkene

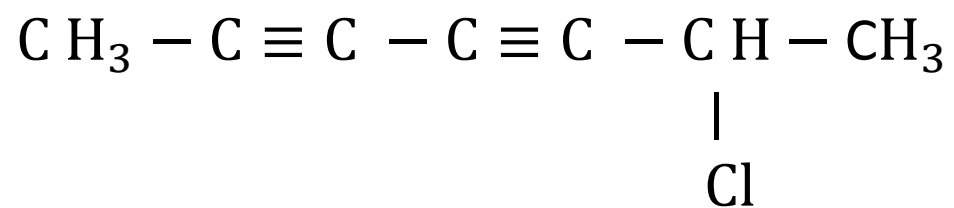




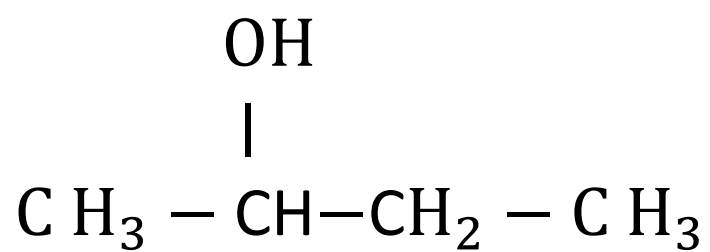
Nomenclature of Alkyne



Nomenclature of Alkyne

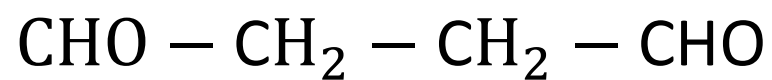
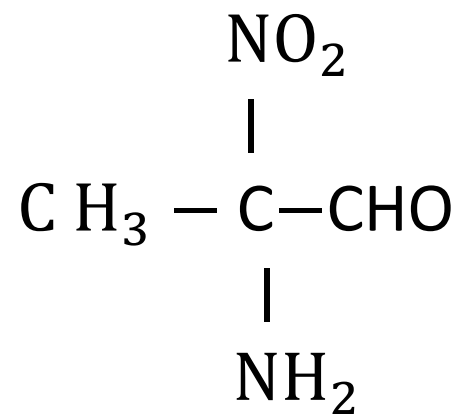
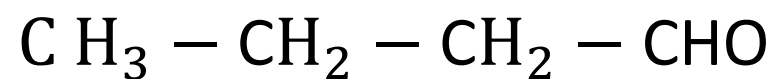


Nomenclature of Alcohol





Nomenclature of Aldehyde





Nomenclature of Carboxylic acid

