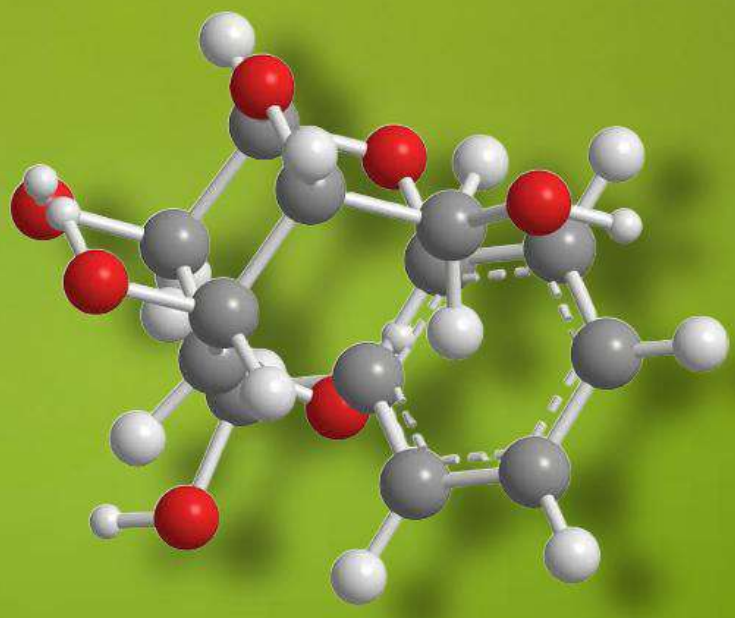
Concept Walla

Ashutosh Sir presents

BASIC ORGANIC CHEMISTRY

For:- 11th & 12th



Organic Chemistry

Organic means - "Life".

Compounds
- Organic cpds → Living organism
  - plants
  - Animals
- Inorganic cpds → Non-Living
  - Minerals
  - Gas.

Organic compounds :-

The compound which are extract from living organisms like plants and animals are called organic compounds.

Eg :- Fruit, milk, meat, Glocose, etc.

Inorganic compounds :-

The compounds which are extract from non-living are called inorganic compounds.

Eg :- Rock, sand, H_2, O_2, N_2, etc.

Organic chemistry :-

The branch of chemistry that we deals we study abouts carbon and compounds of carbon.

OR

The branch of chemistry that we study about hydrocarbon and their derivatives.

Eg:- CO_2 , C_2O , C_2CO_3 , ... , etc.

Hydro carbon :-

When hydrogen and carbon combine to each other then it form hydro carbon.

Ex :- CH_4 , C_2H_6 , CH_3COOH , ... etc.

NOTES :-

* 1st organic compounds "urea" (NH_2CONH_2) was discovered by "F. Wohler."

* 1st noble prize gave in chemistry region (organic we chem.) by "Vonthoff" in 1901. He proposed carbon is a

tetra valency.

* In 1815, Berzelius was 1st scientist who gave "Vital force theory" which are responsible for the formation of organic compounds from inorganic compounds.

Preparation of urea

When Ammonium cynates undergoes rearrangement reaction, to show urea.

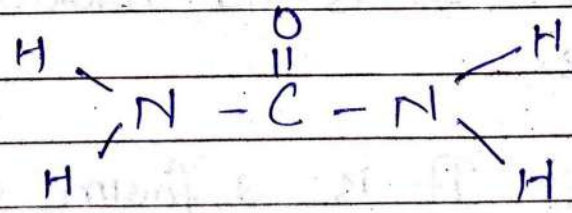
$NH_4CNO \xrightarrow{\text{rearrange}} NH_2CONH_2$ or $CO(NH_2)_2$

(Amonium cynates) → Inorganic

NH_2CONH_2 → Organic

* Urea prepared by "Fedrick wohler" in "1828" in Laboratory.

Bond formation of urea.



* Methane (CH_4) or Marsh gas is synthesised by "Berthlot" in "1856" in Lab by inorganic source.

* Acid (ethanoic or Acetice) এর CH_3COOH কে প্রথম prepared by "Kolbe" in "1845" by the combination of elements in laboratory by inorganic source.

Properties of Carbon

(i) Carbon is a Non-metal.

(ii) It does not conduct electricity.

(iii) Carbon is a Allotrophs.

Allotrophs :- The compoud which exist in more form, is called allotrophs. This form is called Allotrophic form.

Carbon allotrophs are :-

i) Diamond
ii) Graphite
iii) Buck-minster fullerence.

(i) Diamond :- It is the hardest substance in nature.

(ii) Graphite :- It is a form of non-metal but it conduct electricity.

(iii) Buck-minster fullerence :- The largest molecule is Buck-minster fullerence. Their formula is C_{60} and structure

like football.

(iv) Atomic no. of carbon is 6.
${}_6C$ - 2, 4.

(v) It contain 4 valence e^-.

(vi) Valency of carbon is 4

(vii) Carbon shows Isotopes.

Isotopes :- The element which have same atomic number but having different mass no. are called isotopes.

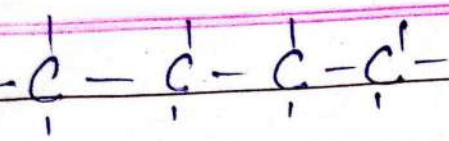
Eg :- ${}^{12}_{6}C$, ${}^{13}_{6}C$, ${}^{14}_{6}C$

Versatile Nature of Carbon
Or
Unique property of Carbon

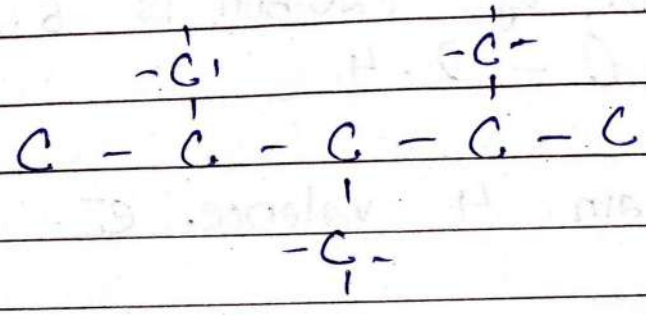
i) Catenation
ii) Tetra valency
iii) Multiple Bonding

(i) Catenation :-

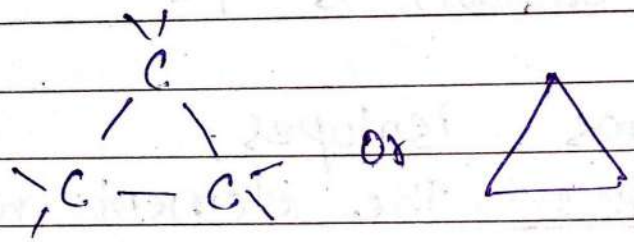
The self linkage of carbon into open chain structure, open branch chain structure, close chain structure and close branch chain structure. This property of carbon is called Catenation



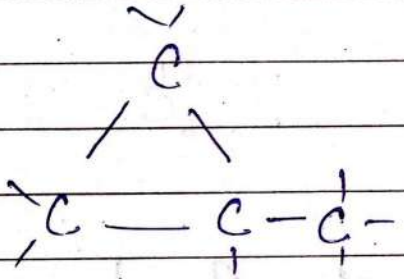
→ open chain structure.



→ open branched chain structure



→ Close chain structure



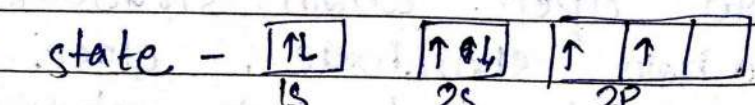
→ close branched chain structure.

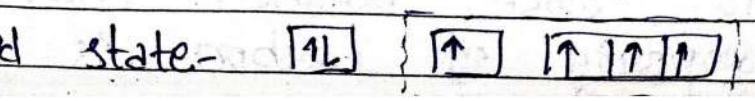
(ii) Tetra-Valency :-

Carbon contain 4 e⁻ in outermost shell it means the valency of carbon is 4. Hence, carbon is tetra valence.

$_6C - 2, 4$

$_6C - 1s^2\ 2s^2\ 2p^2$.

In ground state - 

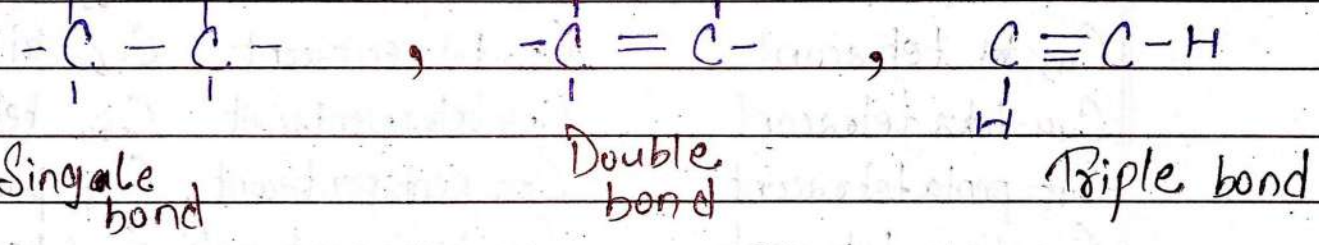
In exited state- 

Unpaired $e^- = 4$.

Valency of C is 4.

(iii) Multiple Bonding

When 1 carbon unite with another carbon atom with the help of single bond, double bond and triple bond, this property of carbon is called multiple bonding.



Single bond | Double bond | Triple bond

Word Root

C_1 - meth	C_{11} - undec/ hendec	C_{21} - un-eicos
C_2 - eth	C_{12} - dodec	C_{22} - do-eicos
C_3 - prop	C_{13} - tridec	C_{23} - tricos
C_4 - but	C_{14} - tetradec	C_{24} - tetracos
C_5 - pent	C_{15} - pentadec	C_{25} - pentacos
C_6 - hex	C_{16} - hexadec	C_{26} - Hexacos
C_7 - Hept	C_{17} - Heptadec	C_{27} - Heptacos
C_8 - Oct	C_{18} - Octadec	C_{28} - Octacos
C_9 - Non	C_{19} - Nonadec	C_{29} - Nonacos
C_{10} - dec	C_{20} - Eicos	C_{30} - tricont

C_{40} - tetracont
C_{50} - Pentacont
C_{60} - Hexacont
C_{70} - Heptacont
C_{80} - Octacont
C_{90} - Nonacont
C_{100} - hect

C_{31} - untricont
C_{32} - dotricont
C_{33} - tritricont
C_{34} - tetratricont
C_{35} - pentatricont
C_{36} - hexatricont
C_{37} - heptatricont
C_{38} - octatricont
C_{39} - nonatricont
C_{40} - tetracont

C_{41} - untetracont
C_{42} - dotetracont
C_{43} - tritetracont
C_{44} - tetratetracont
C_{45} - pentatetracont
C_{46} - hexatetracont
C_{47} - heptatetracont
C_{48} - octatetracont
C_{49} - nonatetracont
C_{50} - pentacont

C_{51} - unpentacont
C_{52} dopentacont
C_{53} - tripentacont
C_{54} tetrapentacont
C_{55} - pentapentacont
C_{56} - hexapentacont
C_{57} - heptapentacont
C_{58} - octapentacont
C_{59} - nonapentacont
C_{60} - hexacont

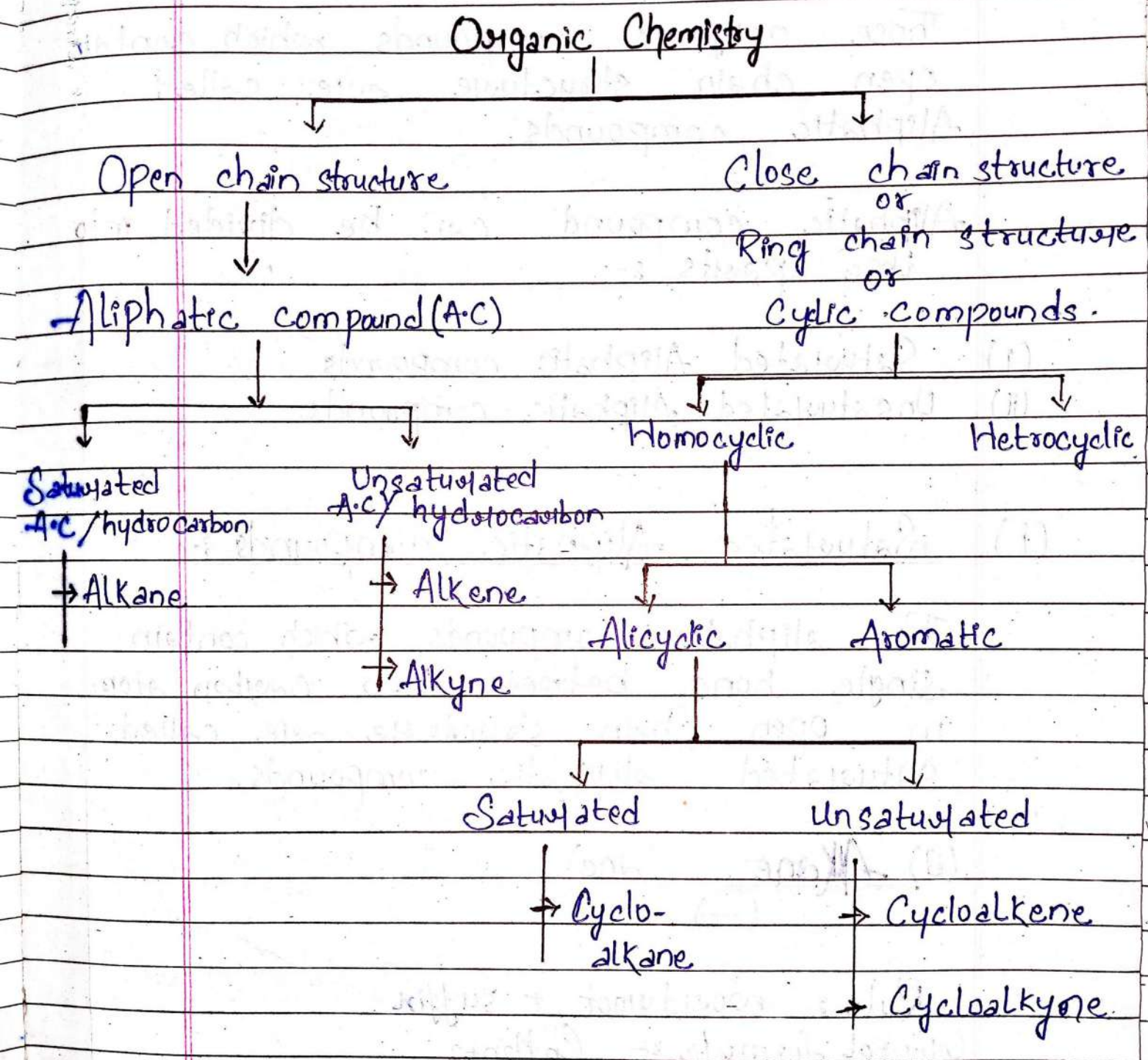
C_{61} - un hexacont
C_{62} - do hexacont
C_{63} - tri hexacont
C_{64} - tetrahexacont
C_{65} - penta hexacont
C_{66} - hexa hexacont
C_{67} - hepta hexacont
C_{68} - octat hexacont
C_{69} - nona hexacont
C_{70} - Heptacont

C_{71} - unheptacont
C_{72} - doheptacont
C_{73} - triheptacont
C_{74} - tetraheptacont
C_{75} - penta heptacont
C_{76} - hexa heptacont
C_{77} - hepta heptacont
C_{78} - octa heptacont
C_{79} - nona heptacont
C_{80} - octacont

C_{81} - unoctacont
C_{82} dooctacont
C_{83} - trioctacont
C_{84} - tetraoctacont
C_{85} - pentaoctacont
C_{86} - hexaoctacont
C_{87} - heptaoctacont
C_{88} - octaoctacont
C_{89} - nonaoctacont
C_{90} - Nonacont

C_{91} - unnonacont
C_{92} - dononacont
C_{93} - trinonacont
C_{94} - tetranonacont
C_{95} - pentanonacont
C_{96} - hexanonacont
C_{97} - heptanonacont
C_{98} - octa nonacont
C_{99} - nonanonacont
C_{100} - Hect

Basic flow chart of organic chem.



Aliphatic compounds :-

Those organic compounds which contain open chain structure are called Aliphatic compounds.

Aliphatic compound can be divided into two parts :-

(i) Saturated Aliphatic compounds
(ii) Unsaturated Aliphatic compounds.

(i) Saturated Aliphatic compounds :-

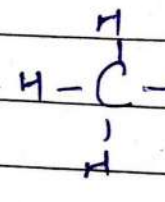
The aliphatic compounds which contain single bond between two Carbon atom in open chain structure are called saturated aliphatic compounds.

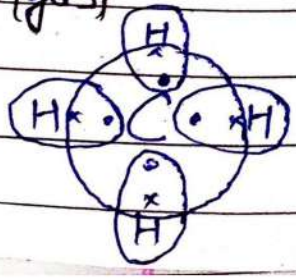
(a) Alkane (ane)
(—)

Rule :- word root + suffix
General formula :- C_nH_{2n+2}

$n = 1$

CH_4 methane or (Marshgas)

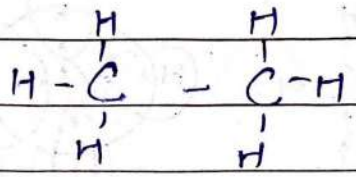




$n = 2$

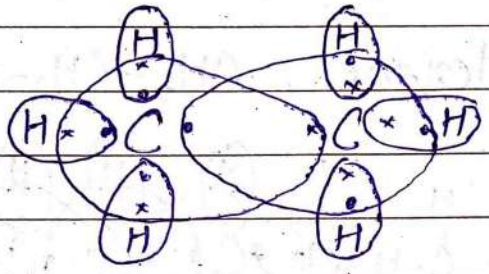
C_2H_6 Ethane → cpds name.

(molecular formula)



(structural formula)
or
(skeleton formula)

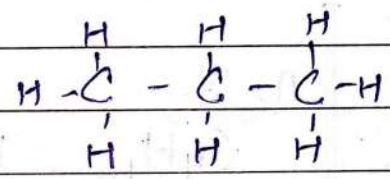
$CH_3 - CH_3$ (condenced formula).

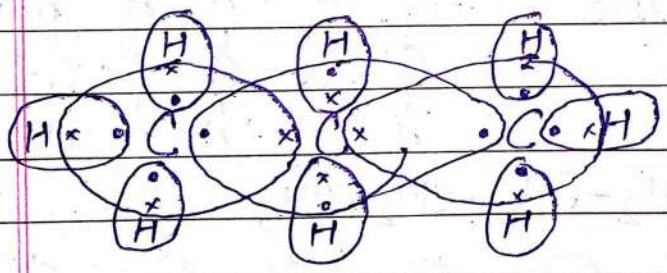


(Lewis dot structure)

$n = 3$

C_3H_8, propane.

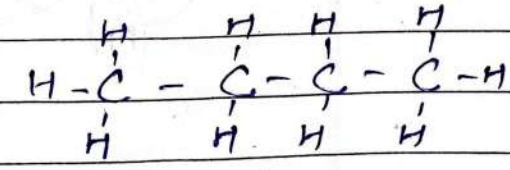


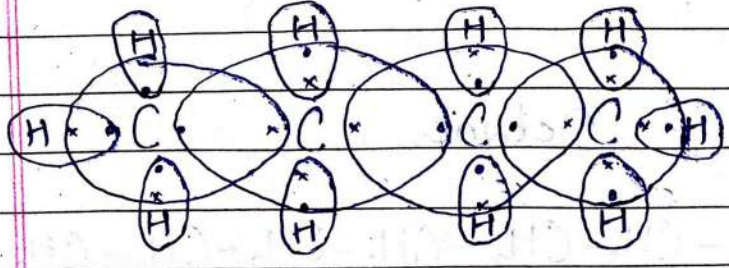


$CH_3 - CH_2 - CH_3$

$n = 4$

C_4H_{10}, Butane

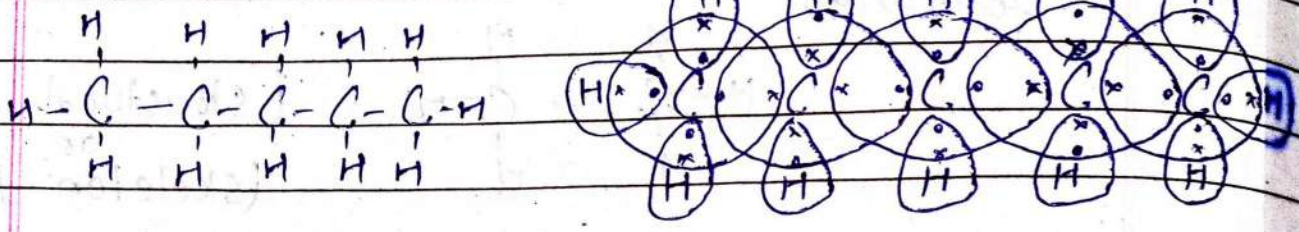




$CH_3 - CH_2 - CH_2 - CH_3$

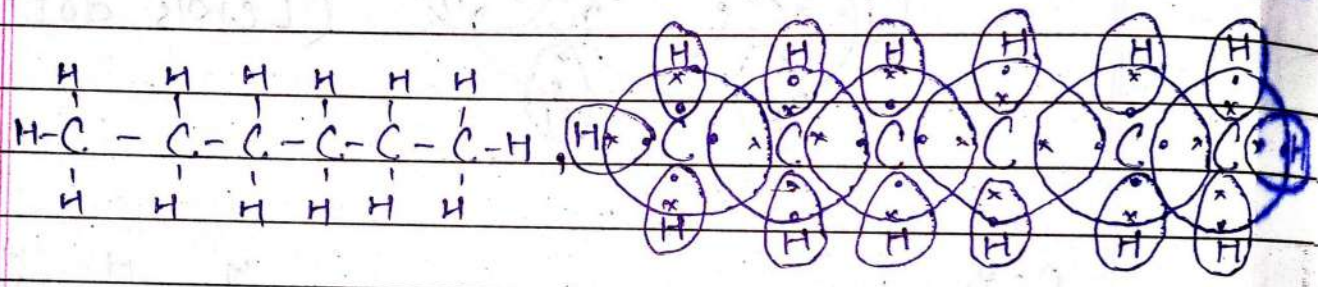
n = 5

C_5H_{12} , Pentane , $CH_3-CH_2-CH_2-CH_2-CH_3$



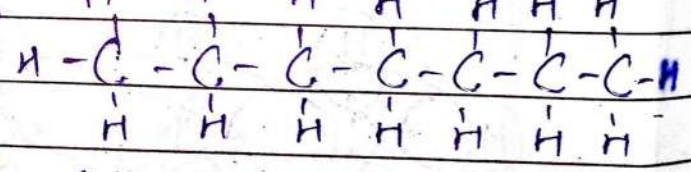
n = 6

C_6H_{14} , Hexane , $CH_3-CH_2-CH_2-CH_2-CH_2-CH_3$

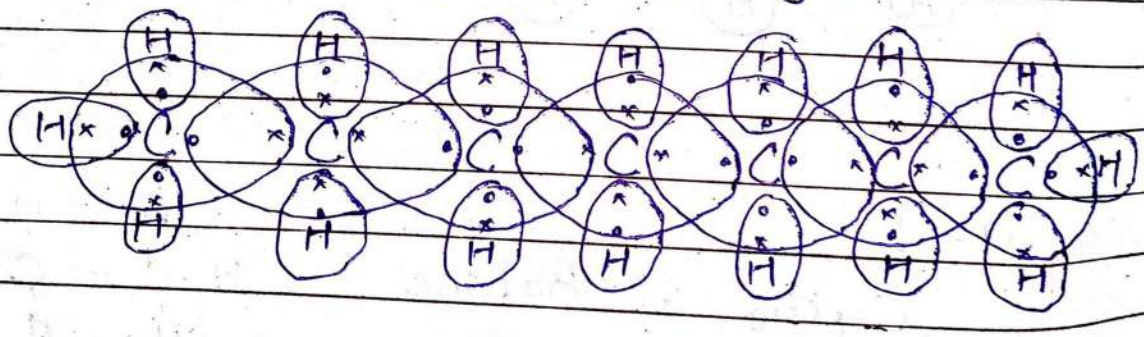


n = 7

C_7H_{16} , Heptane ,



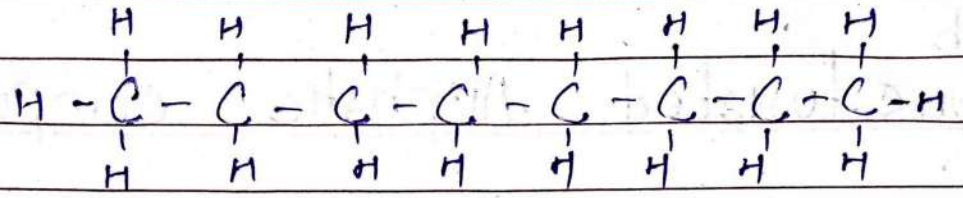
$CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3$

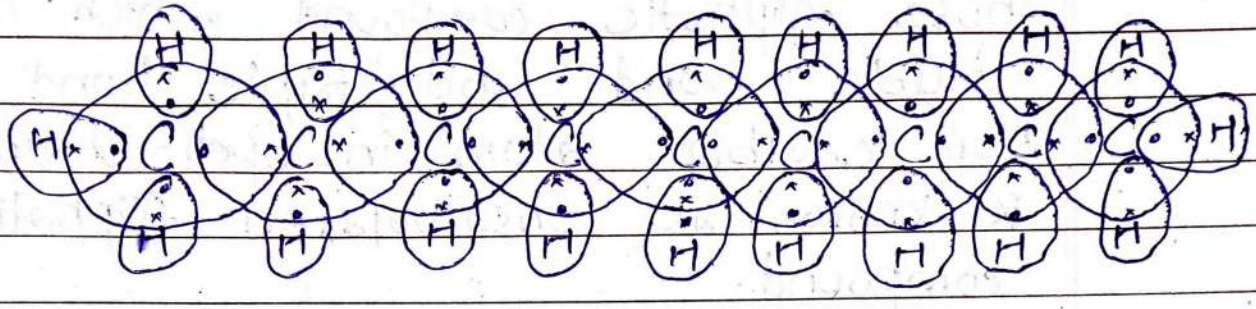


n = 8

C_8H_{18} , Octane.

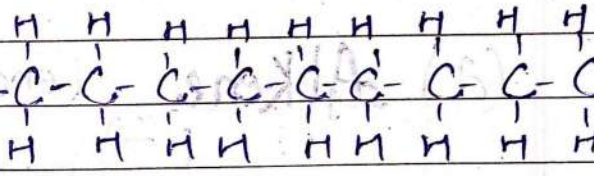
$CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3$



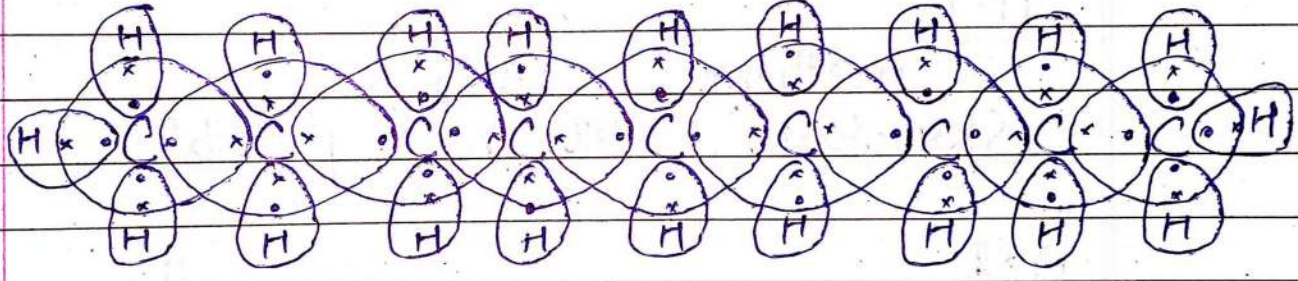


$n = 9$

C_9H_{20} , Nonane ,

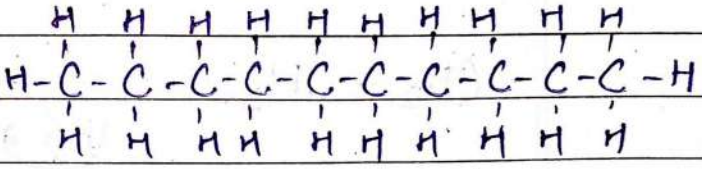


$CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3$

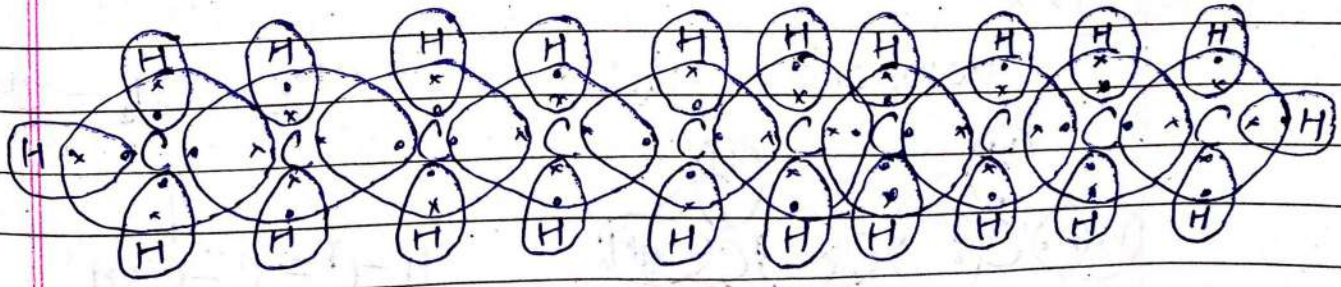


$n = 10$

$C_{10}H_{22}$, Decane ,



$CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_3$



(ii) Unsaturated Aliphatic Compounds :-

Those Aliphatic compound which contain double bond and triple bond between two carbon atom in open-chain structure is known as unsaturated Aliphatic compound.

(a) Alkene (ene)

(=)

General formula :- C_nH_{2n}

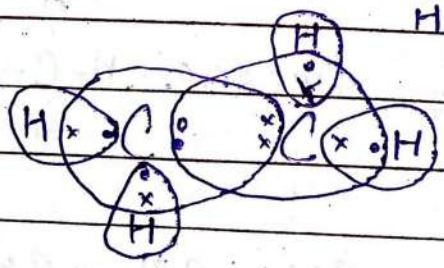
n = 1

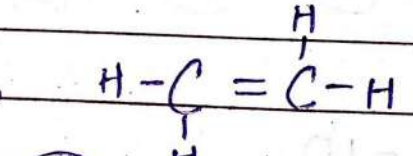
methene , CH_2

Structure will not possible.

n = 2

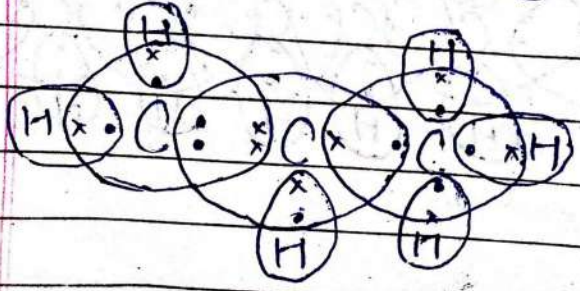
Ethene , C_2H_4 , $CH_2 = CH_2$

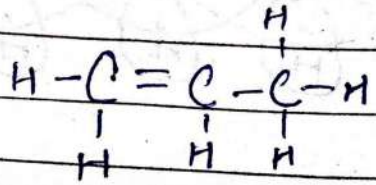




n = 3

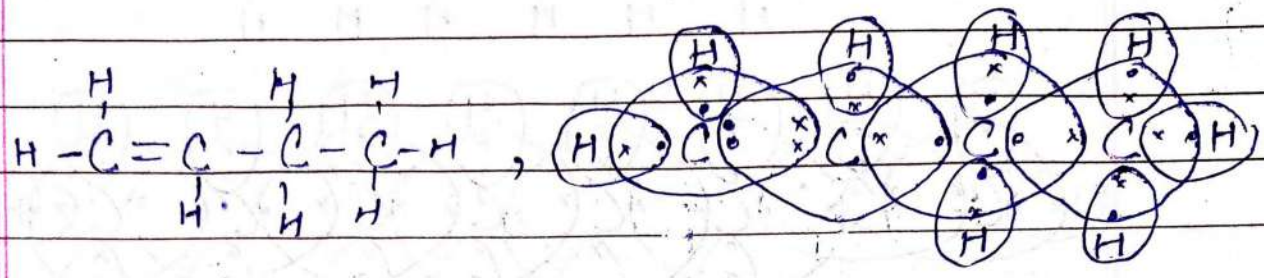
propene , C_3H_6 , $CH_2 = CH - CH_3$





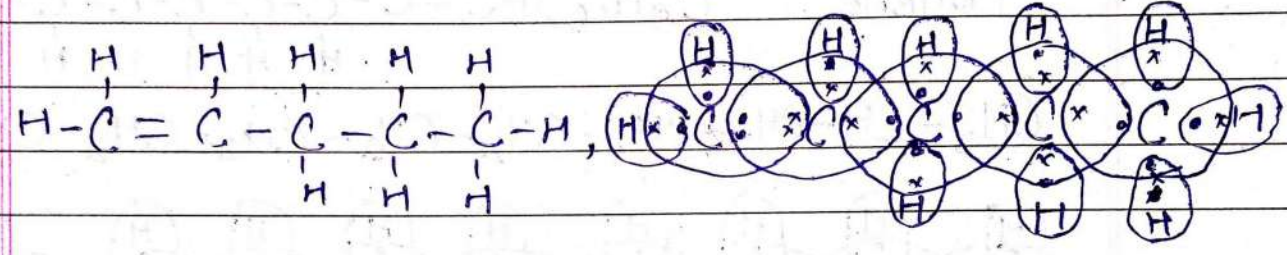
n = 4

butene , C_4H_8 , $CH_2 = CH - CH_2 - CH_3$



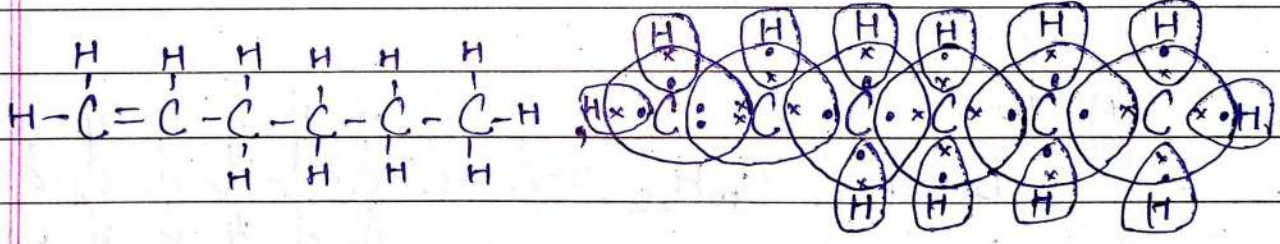
n = 5

pentene , C_5H_{10} , $CH_2 = CH - CH_2 - CH_2 - CH_3$



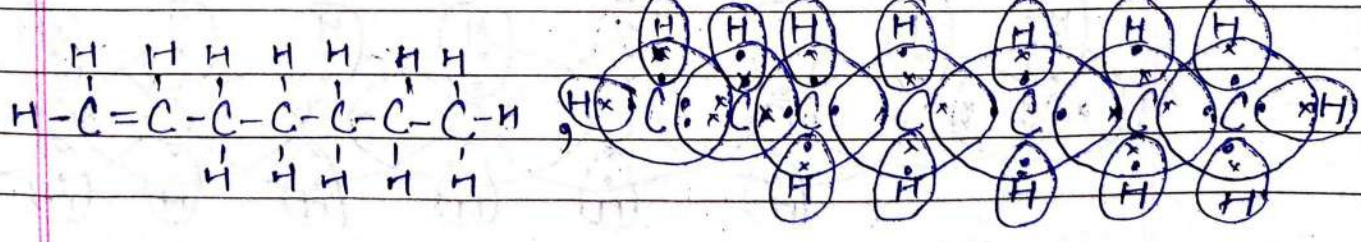
n = 6

hexene , C_6H_{12} , $CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_3$



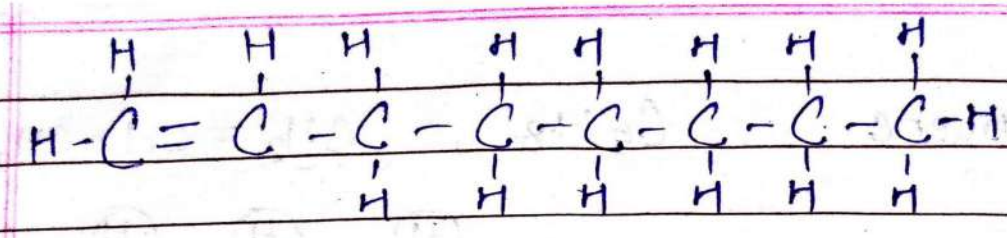
n = 7

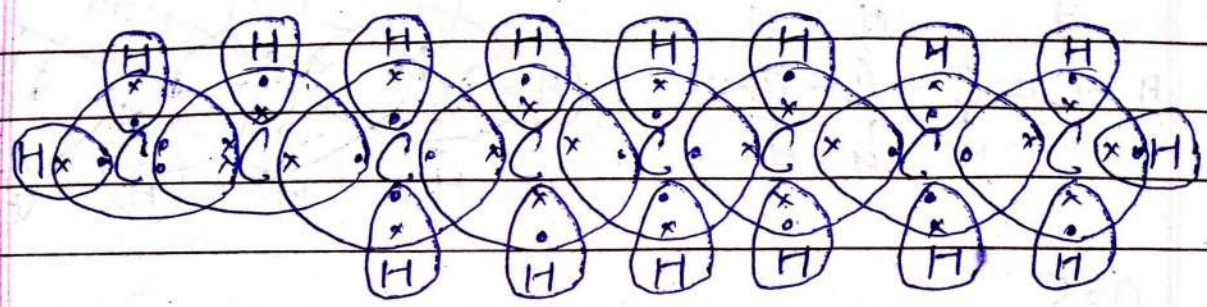
Heptene , C_7H_{14} , $CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$



n = 8

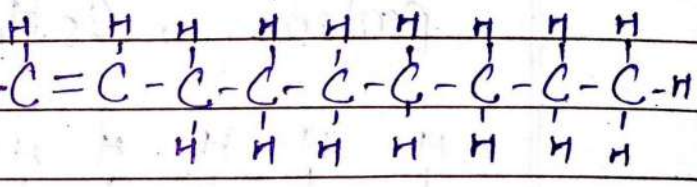
Octane , C_8H_{16} , $CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$



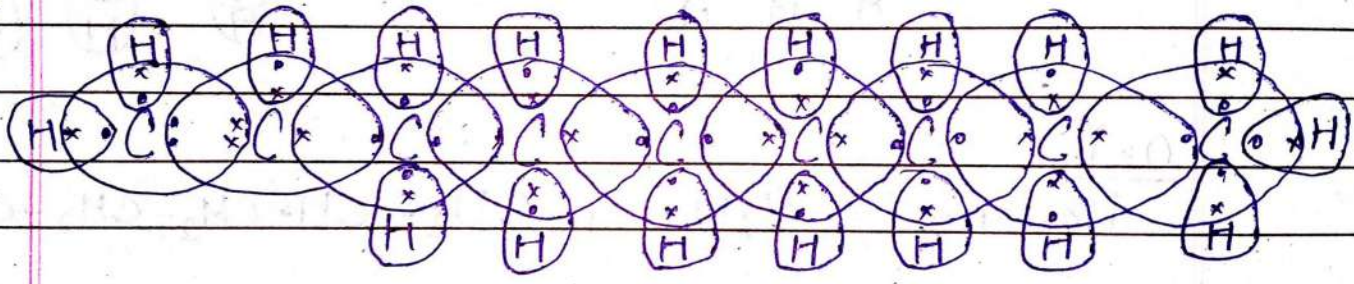


$n = 9$

Nonene, C_9H_{18},

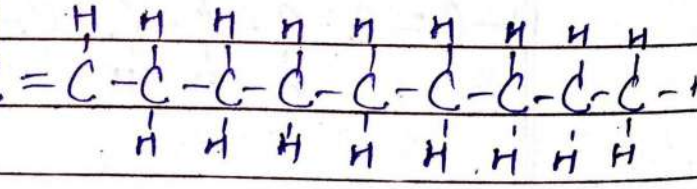


$CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

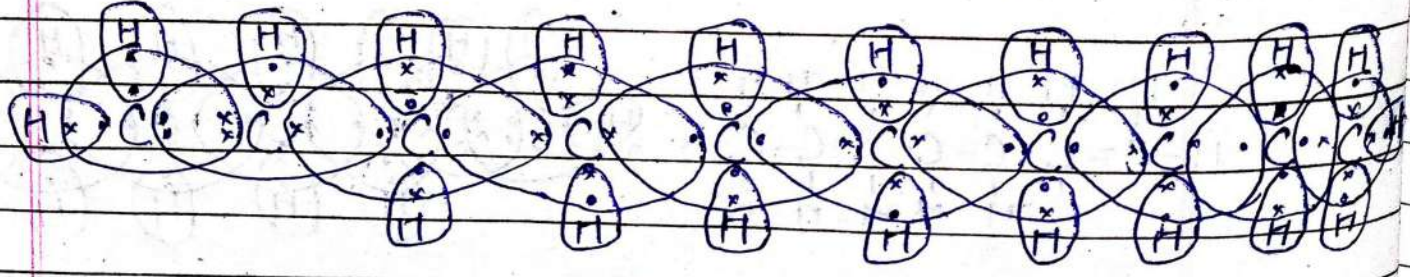


$n = 10$

Decene, $C_{10}H_{20}$,



$CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$



(b) Alkyne (+yne)

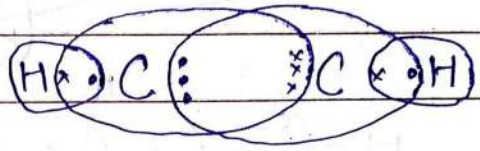
(≡)

Rule :- no + root + suffix

General formula :- C_nH_{2n-2}.

n = 2

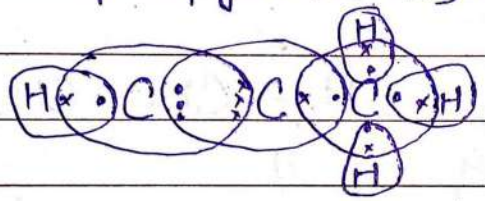
Ethyne, C_2H_2 ,

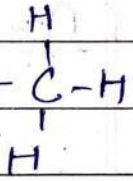


H-C≡C-H , CH≡CH

n = 3

Propyne, C_3H_4 ,

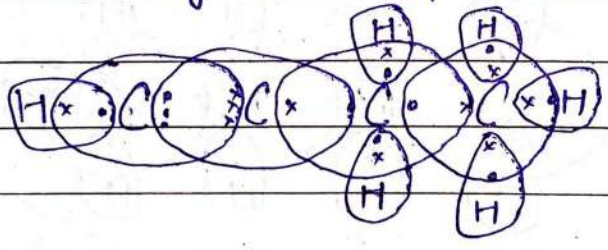


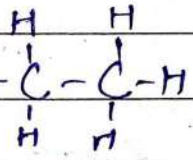


CH≡C-CH$_3$

n = 4

butyne, C_4H_6 ,

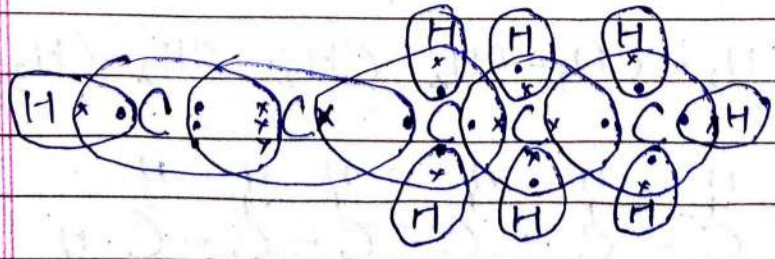


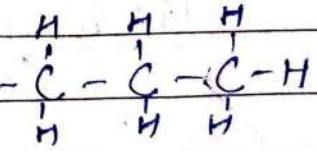


CH-C-CH$_2$-CH$_3$.

n = 5

pentyne, C_5H_8 ,



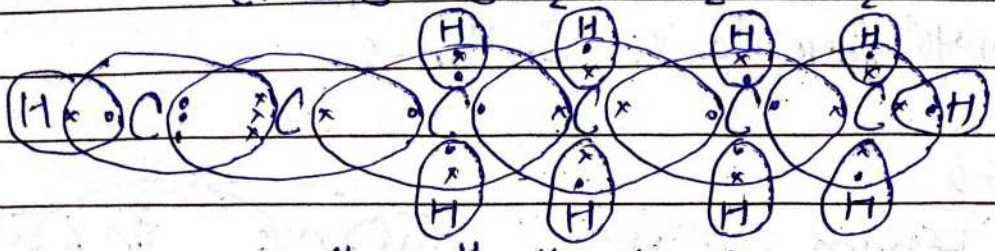


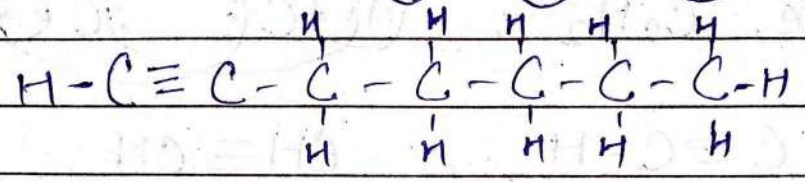
CH-C-CH$_2$-CH$_2$-CH$_3$

n = 6

Hexyne , C_6H_{10} .

$CH \equiv C - CH_2 - CH_2 - CH_2 - CH_3$

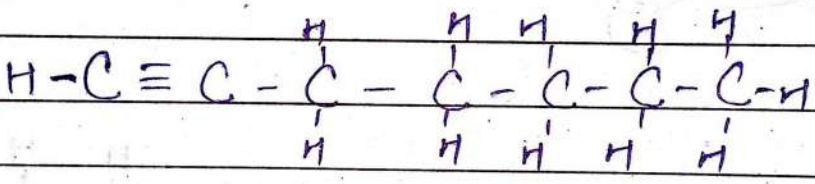


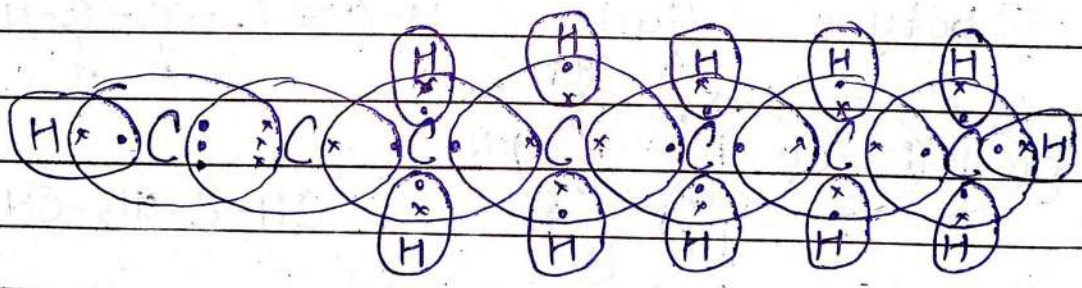


n = 7

Heptyne , C_7H_{12}

$CH \equiv C - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

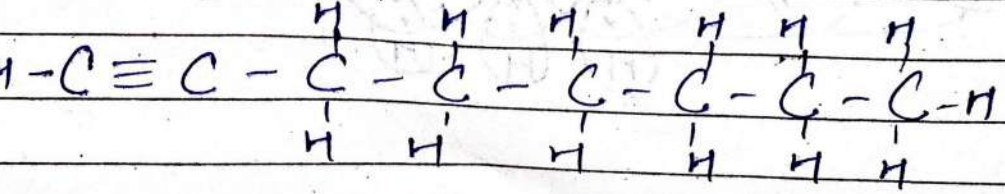


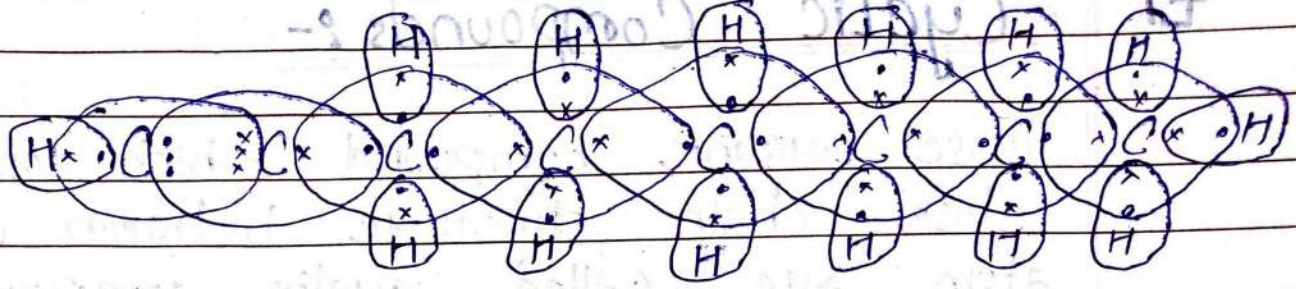


n = 8

Octyne , C_8H_{14}

$CH \equiv C - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

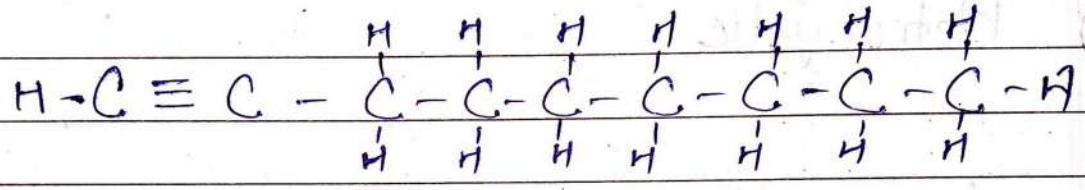


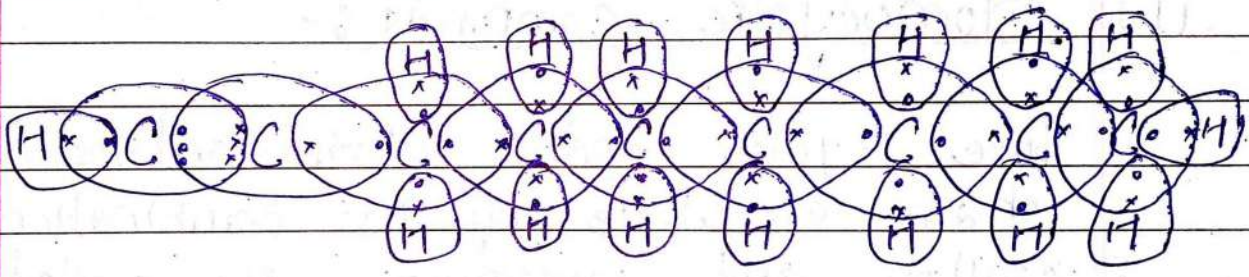


n = 9

Nonyne , C_9H_{16}

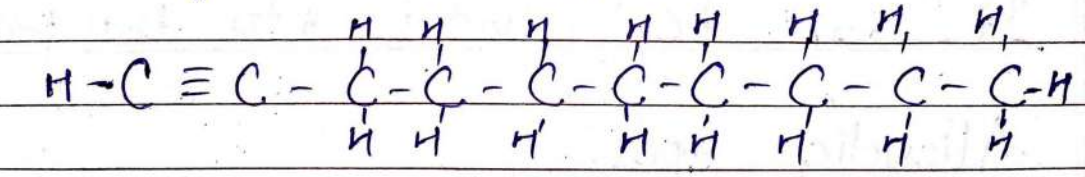
$$CH \equiv C - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$$



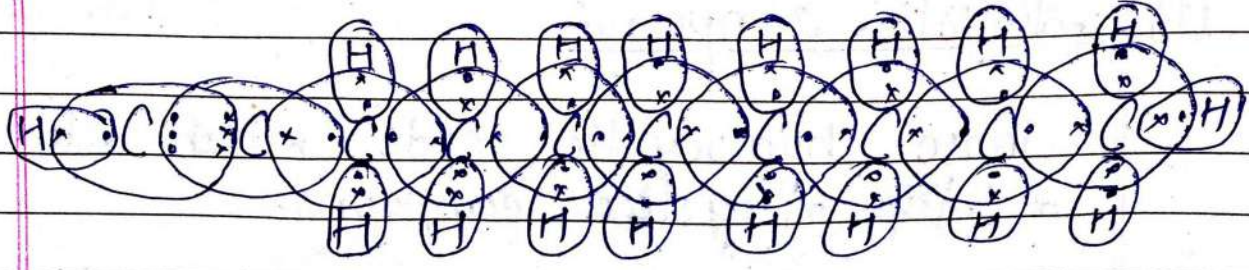


Q = 10

Decyne , $C_{10}H_{18}$



$$CH \equiv C - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$$



Cyclic Compounds :-

Those organic compound which contain close chain structure between carbon atom are called cyclic compound.

There are two types of cyclic compound :-

i) Homo cyclic.
ii) Hetrocyclic

(i) Homocyclic Compounds :-

Those cyclic cpds which contains closed chain structure by the combination of carbon and hydrogen, is called Homo-cyclic cpds.

It can be divided into two parts :-

(i) Alicyclic cpds.
(ii) Aromatic cpds.

(1) Alicyclic compound

Those homocyclic cpds which acts like a Alip Alicphatic compound.

It can be divided into two parts :-

(a) Saturated Alicyclic cpds.
(b) Unsaturated Alyclic cpds

(a) Saturated Alicyclic cpds :-

Those Alicyclic cpds which contain single bond bet^{n} carbon atom in closed chain structure, is called saturated Alicyclic cpds.

Ex :- **Cyclo Alkane**

General formula :- C_nH_{2n}

$n = 1$ } structure will be not possible.
$n = 2$ }

Structure.

$n = 3$ — Trigangle.

$n = 4$ — Square / rectangle.

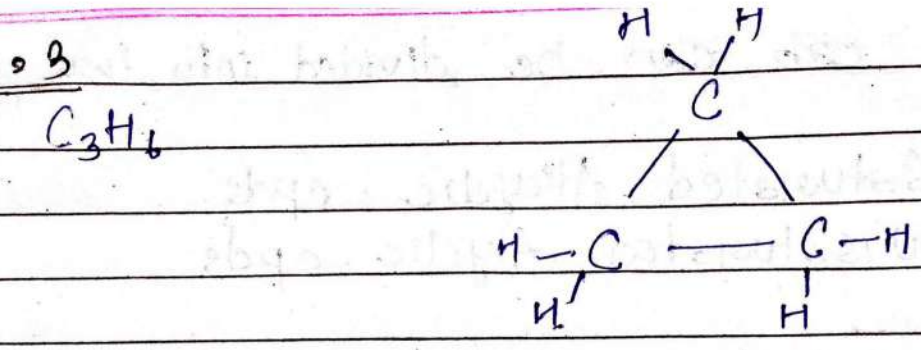
$n = 5$ — Pentagonal

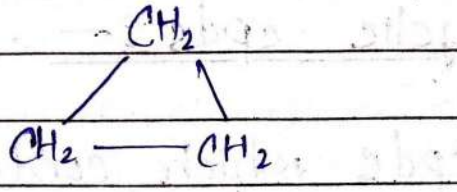
$n = 6$ — Hexagonal

$n = 7$ — Heptagonal.

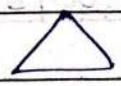
n = 3

C_3H_6





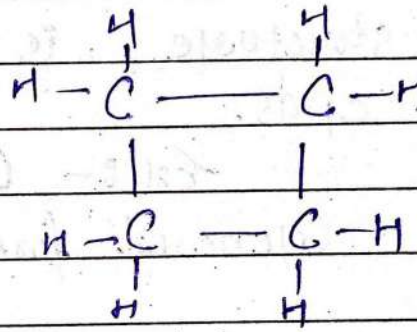
or

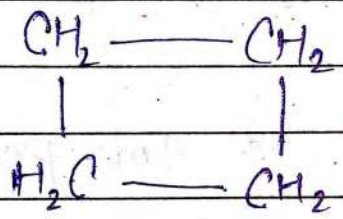


⇒ Cyclo propane.

n = 4

C_4H_8





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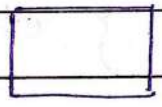
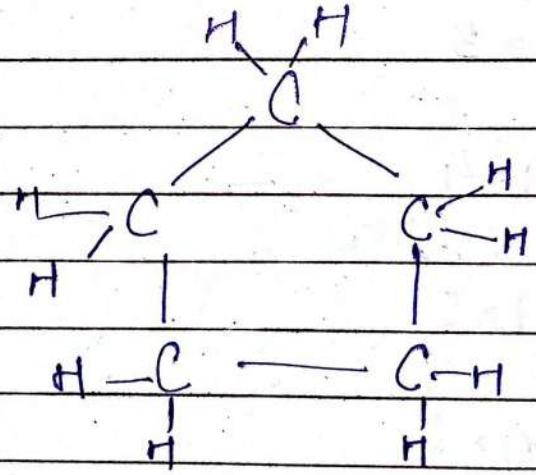
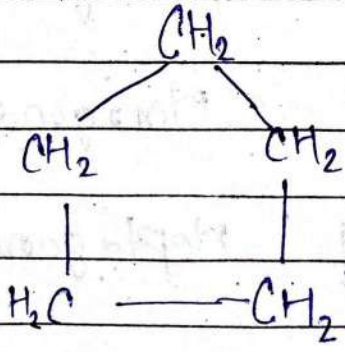


⇒ Cyclo butane.

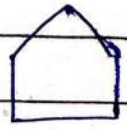
n = 5

C_5H_{10}





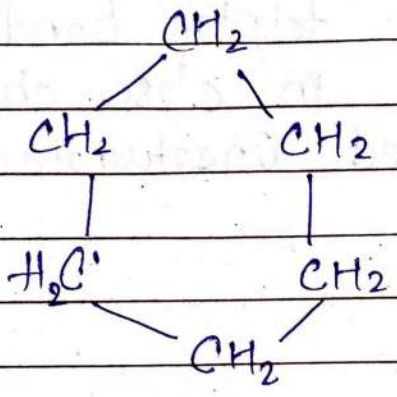
or



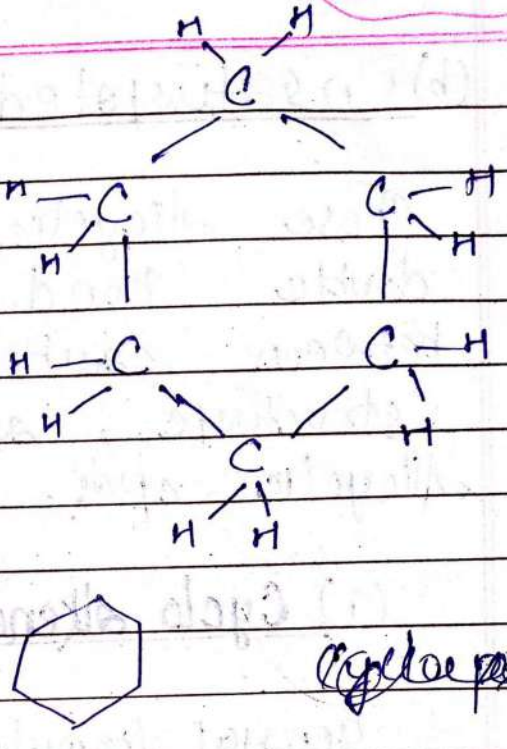
Cyclo pentane

n = 6

C_6H_{12}



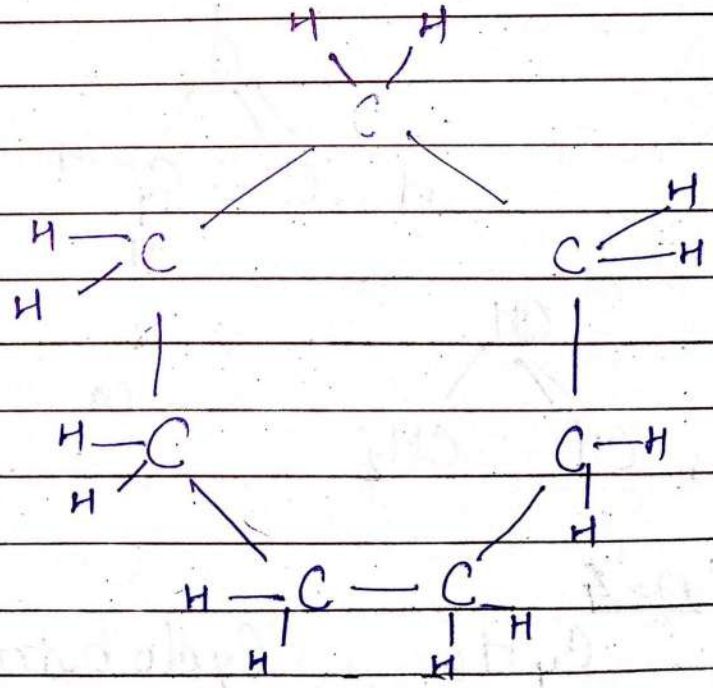
Cyclo hexane ,

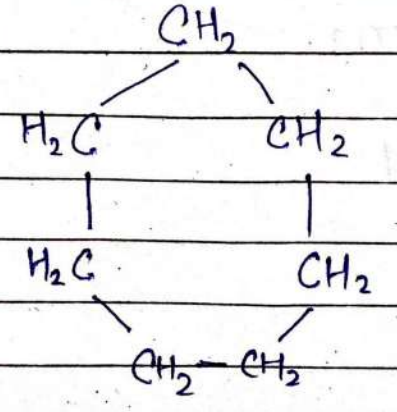


Cyclopentane.

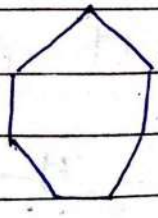
n = 7

C_7H_{14} , Cyclo ~~hexane~~ heptane.





,



(b) Unsaturated Alicyclic cpds :-

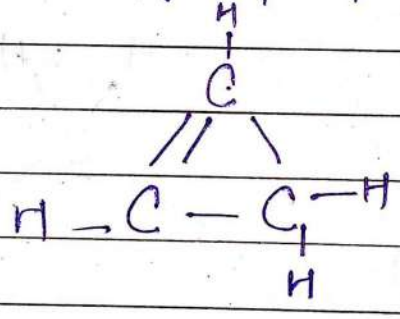
Those alicyclic cpds which contain double bond and triple bond between carbon atom in close chain structure, are called unsaturated Alicyclic cpds.

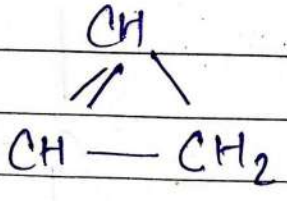
(i) Cyclo alkene. (=)

general formula = C_nH_{2n-2}

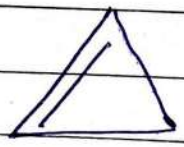
n = 3

C_3H_4 Cyclopropene.



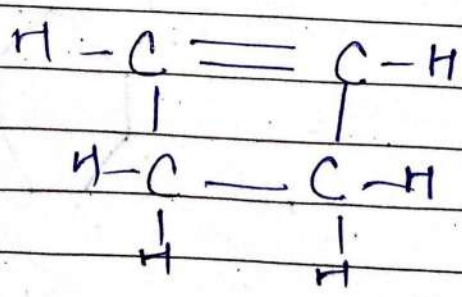


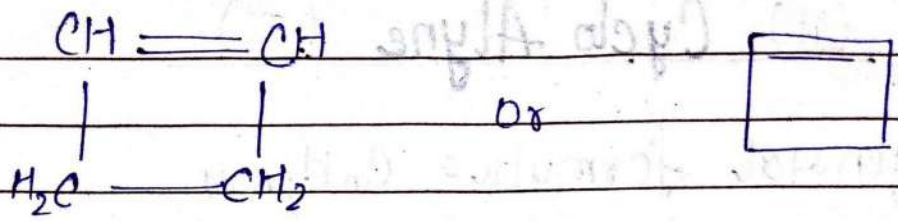
or



n = 4

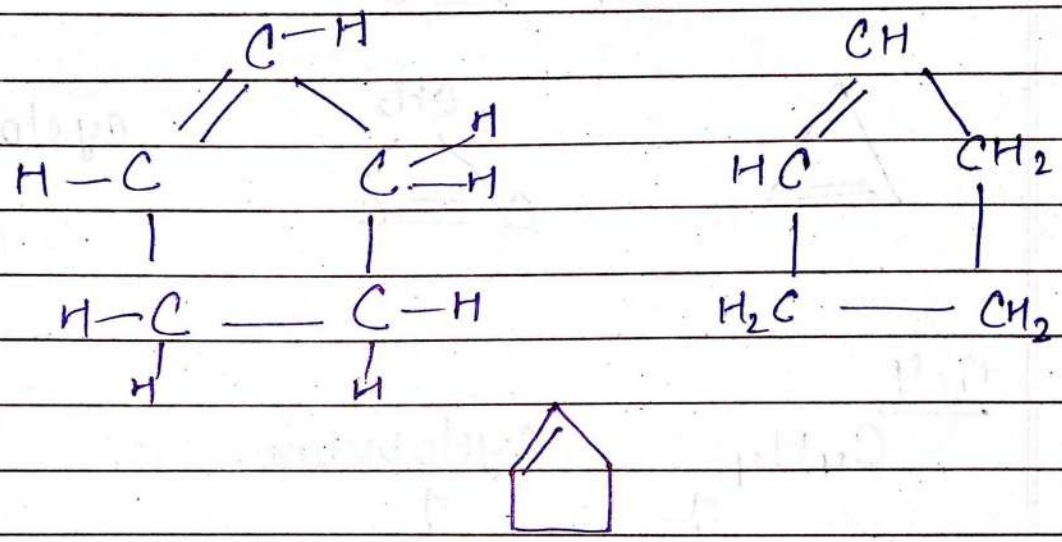
C_4H_6 , Cyclo butene.





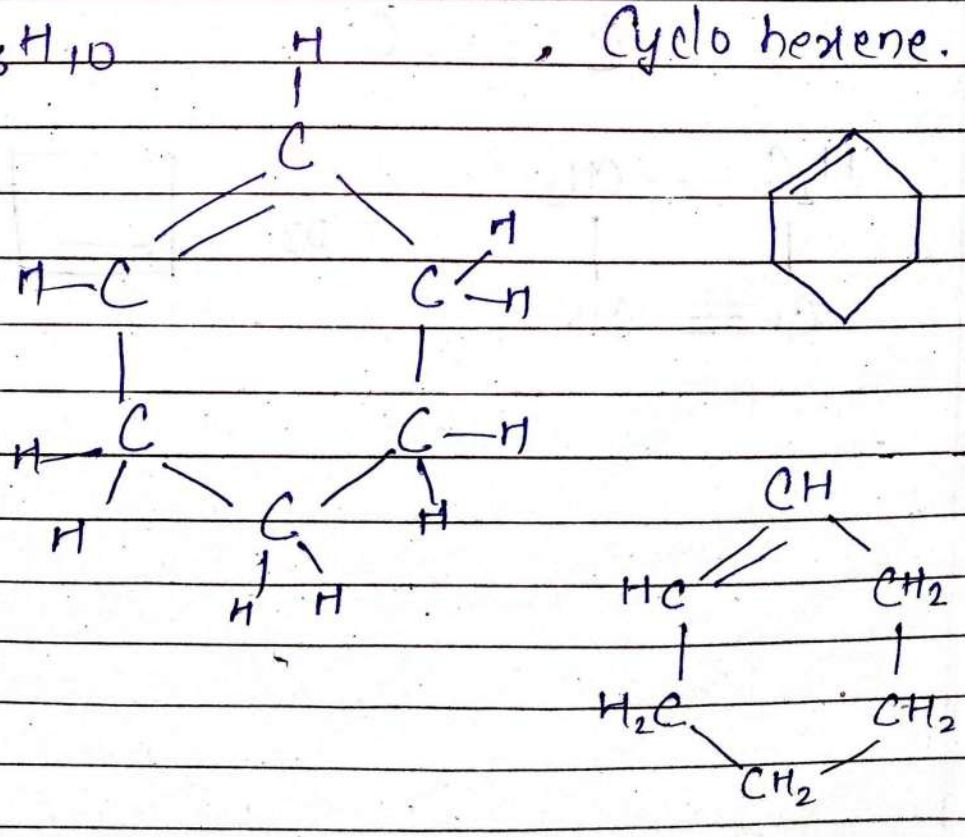
$\eta = 5$

C_5H_8 , cyclopentene.



$\eta = 6$

C_6H_{10} , Cyclo hexene.

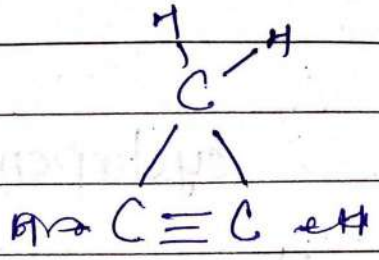


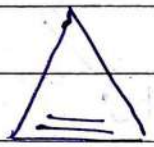
(ii) Cyclo Alyne (≡)

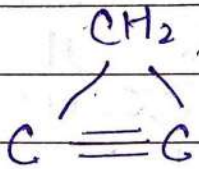
general formula :- C_nH_{2n-4}

n=3

C_3H_2



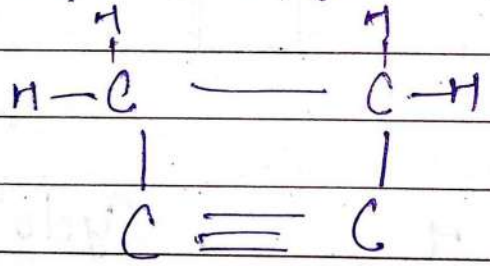


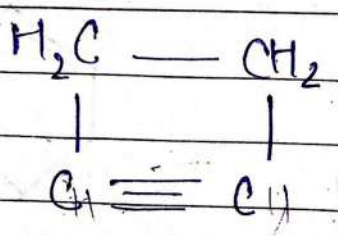


cyclo propyne.

n=4

C_4H_4 , Cyclobutene.





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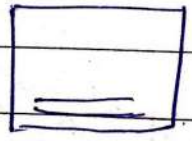
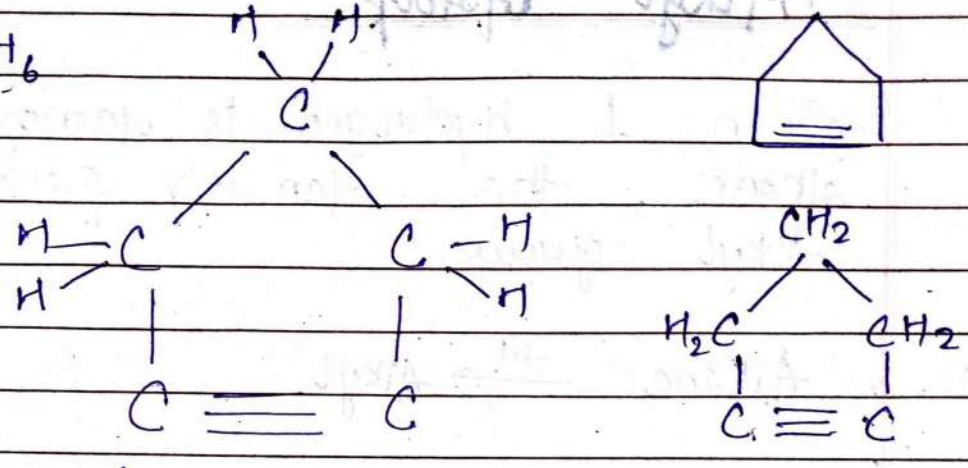


n = 5

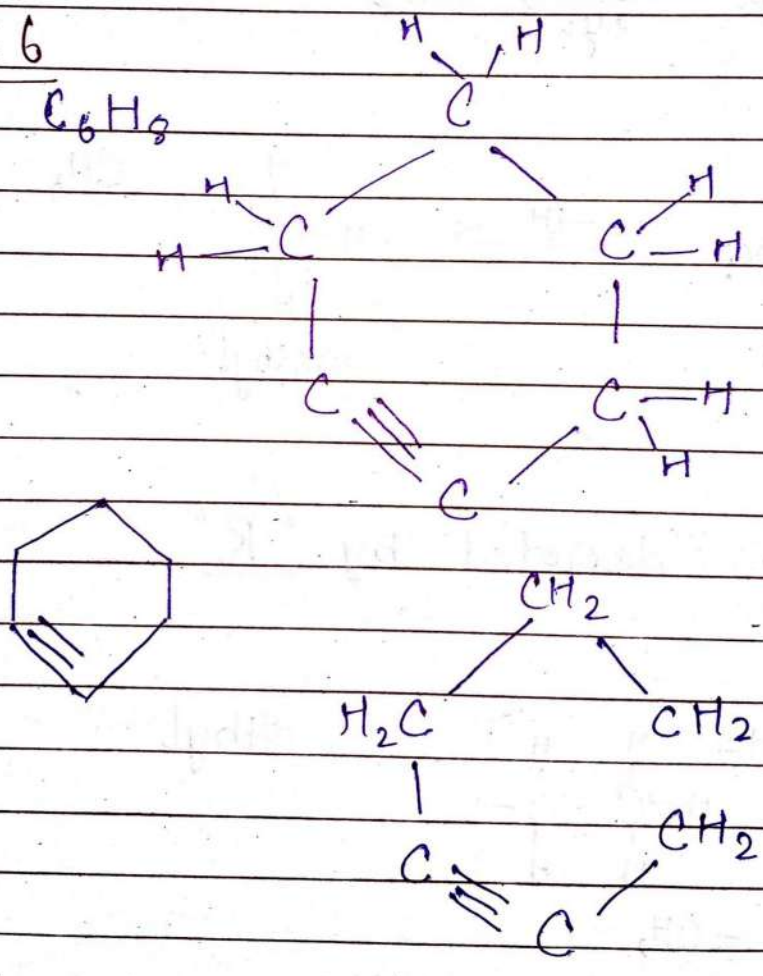
C_5H_6



Cyclo pentyne.

n = 6

C_6H_8



Alkyl Group

When 1 hydrogen is removed from alkane, the remaing part is called Alkyl group.

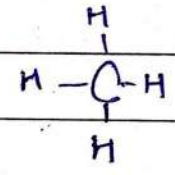
→ Alkane $\xrightarrow{-1H}$ Alkyl

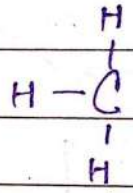
→ $C_nH_{2n+2} \xrightarrow{-1H} C_nH_{2n+1}$

→ Alkane $\xrightarrow[+yl]{-ane}$ Alkyl

n=1

CH_4 Methane. $\xrightarrow{-1H}$ CH_3 methyl.

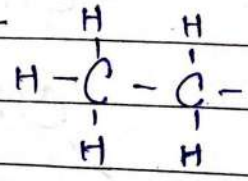




- It is denoted by "R".

n=2

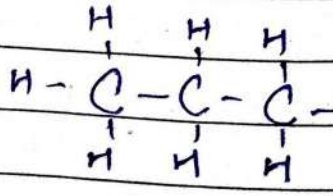
C_2H_5 , Ethyl



$CH_3 - CH_2 -$

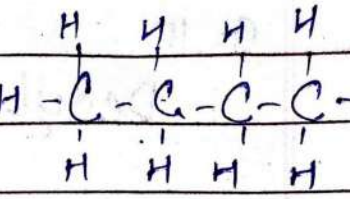
n=3

Propyl , C_3H_7 ,



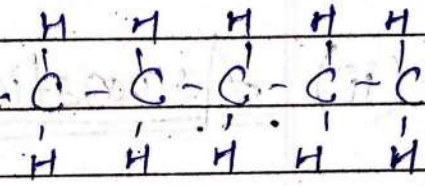
$CH_3 - CH_2 - CH_2 -$

$n = 4$

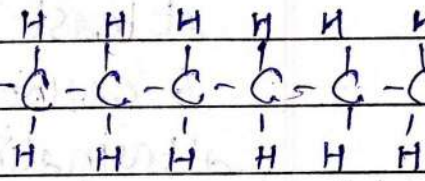
butyl , C_4H_9 , 

$CH_3 - CH_2 - CH_2 - CH_2 -$

$n = 5$

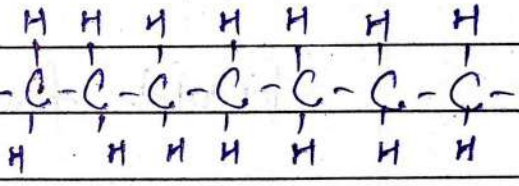
pentyl , C_5H_{11} , 

$n = 6$

hexyl , C_6H_{13} , 

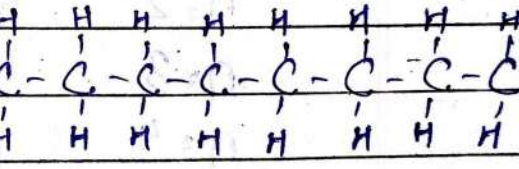
$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 -$

$n = 7$

heptyl , C_7H_{15} , 

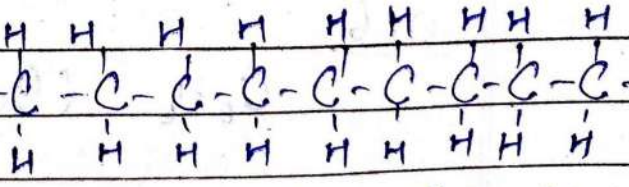
$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 -$

$n = 8$

Octyl , C_8H_{17} , 

$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 -$

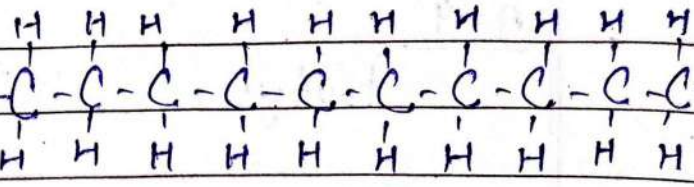
$n = 9$

Nonyl , C_9H_{19} , 

$CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 -$

$n = 10$

Decyl, $C_{10}H_{21}$



$CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-$

(ii) Aromatic compound

Those homocyclic compound which contain atleast one Benzene (1 benzene contain 6 carbon and 6 hydrogen due to alternating arrangement of single bond and double bond.), is called aromatic compound.

[Benzene = (C_6H_6)]

General formula :- C_nH_{2n-6}

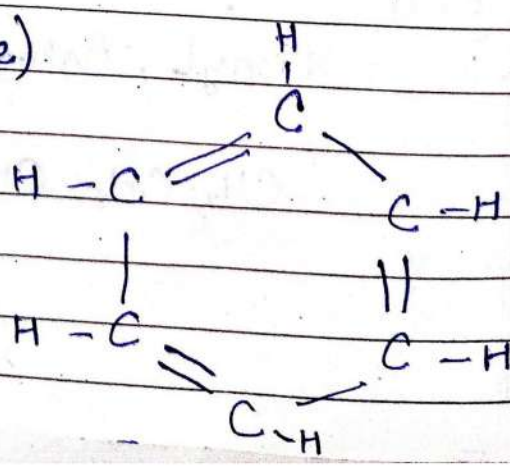
$n = 0$
$n = 1$
$n = 2$
$n = 3$
$n = 4$
$n = 5$

} structure will be not possible

$n = 6$

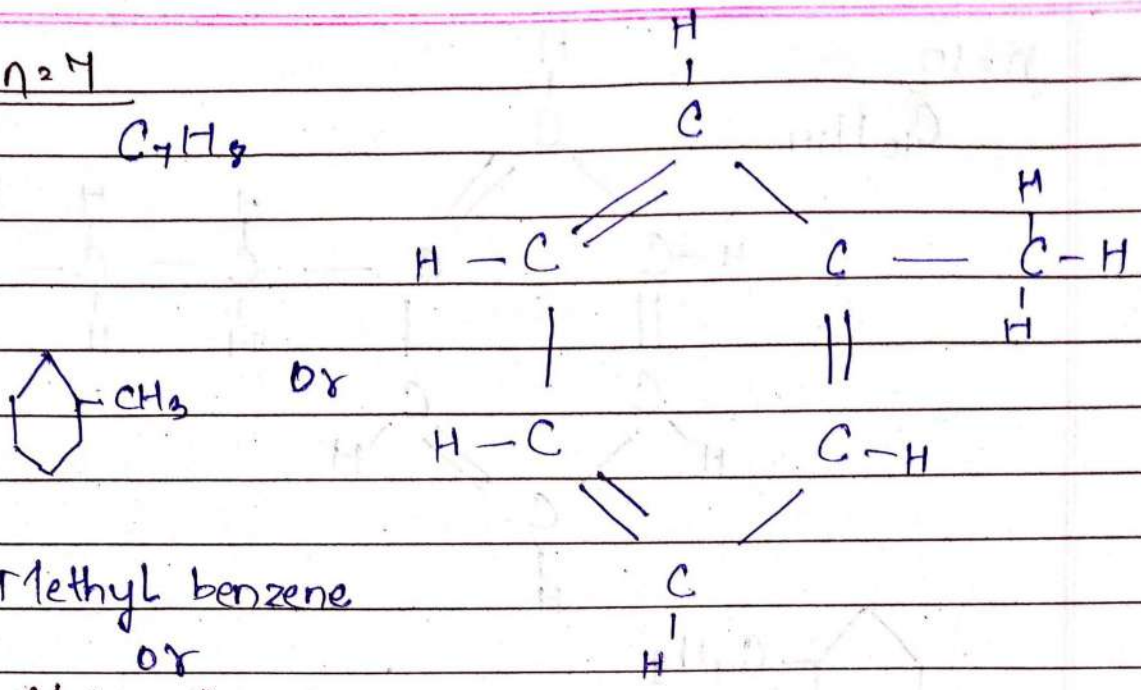
C_6H_6 (Benzene)

or



n = 7

C_7H_8



or

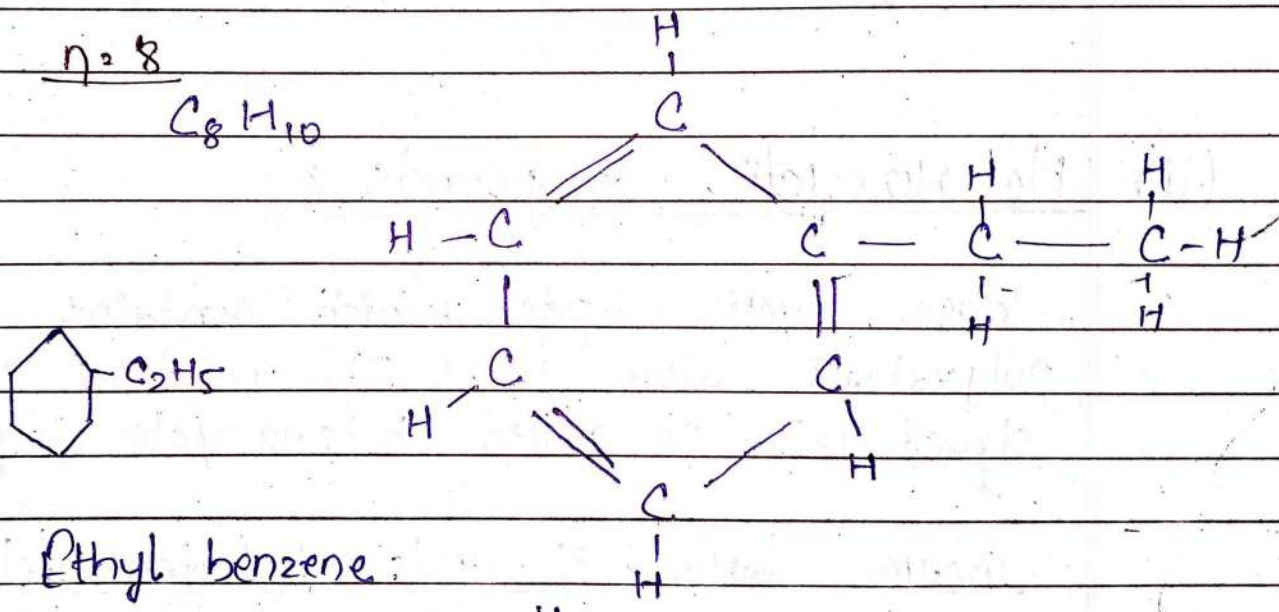
→ Methyl benzene

or

→ (toluene)

n = 8

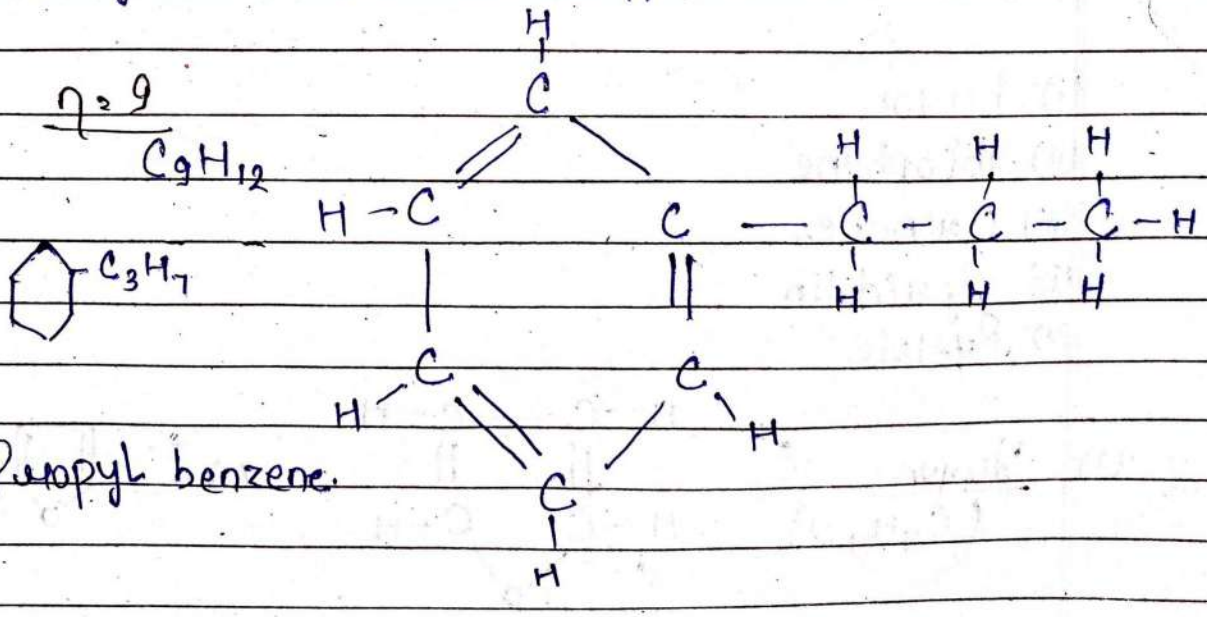
C_8H_{10}



→ Ethyl benzene.

n = 9

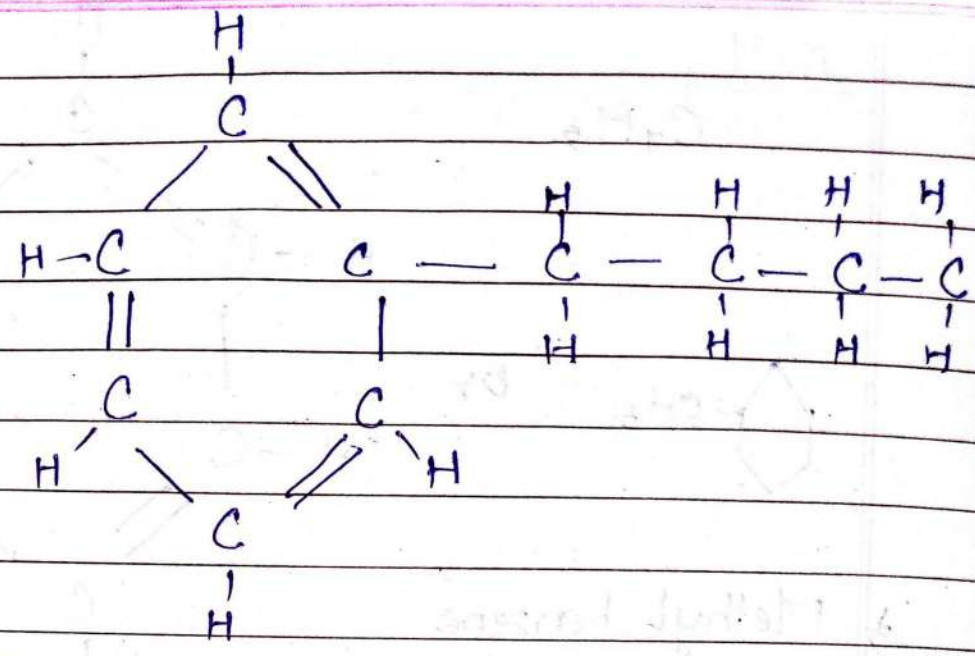
C_9H_{12}

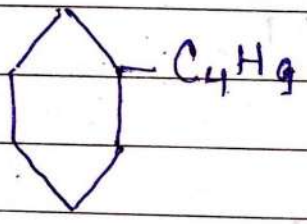


→ Propyl benzene.

n=10

$C_{10}H_{14}$





or butyl benzene

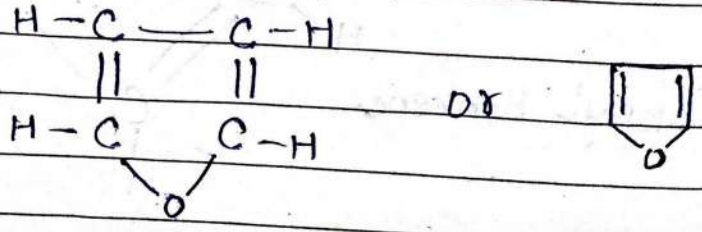
(ii) Heterocyclic compounds :-

Those cyclic cpds which contains polyvalent atom (S, O, N) in close chain structure, is called heterocyclic cpds.

There are 5 cpds of heterocyclics-

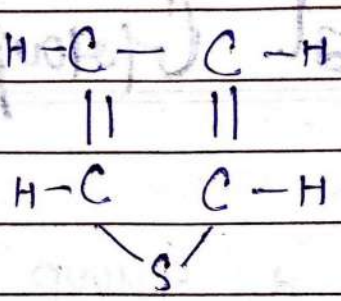
(i) Furon
(ii) Thiophene
(iii) Oxinene
(iv) Pyridulin
(v) Pyrole

(1) Furon (C_4H_4O)



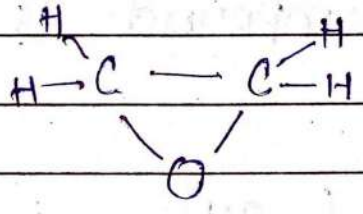
or

(ii) Thiophene
(C_4H_4S)

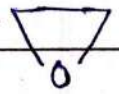


or

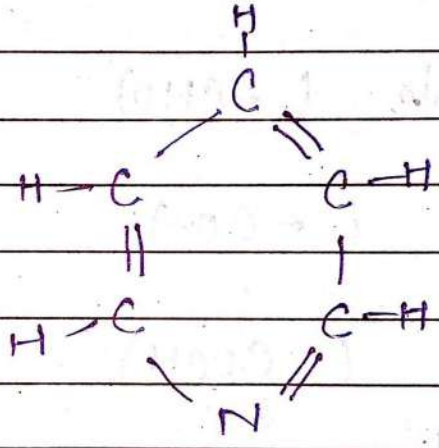
(iii) Oxinene.
(C_2H_4O)



or

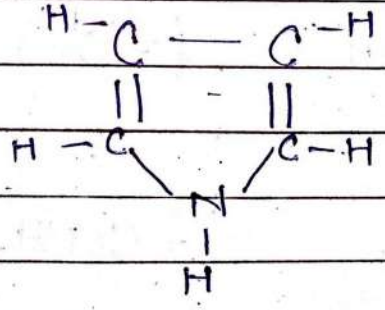


(iv) Pyridulin
(C_5H_5N)



or

(v) Pyrole
(C_4H_5N)



or

Functional Group

A atom or a group of atom which determines the chemical behaviour of organic compound is called functional group.

1) Alcohol (-OH) 

2) Aldehyde (-CHO) 

3) Ketone (-CO-) 

4) Acid (-COOH) 
or
Carboxylic acid

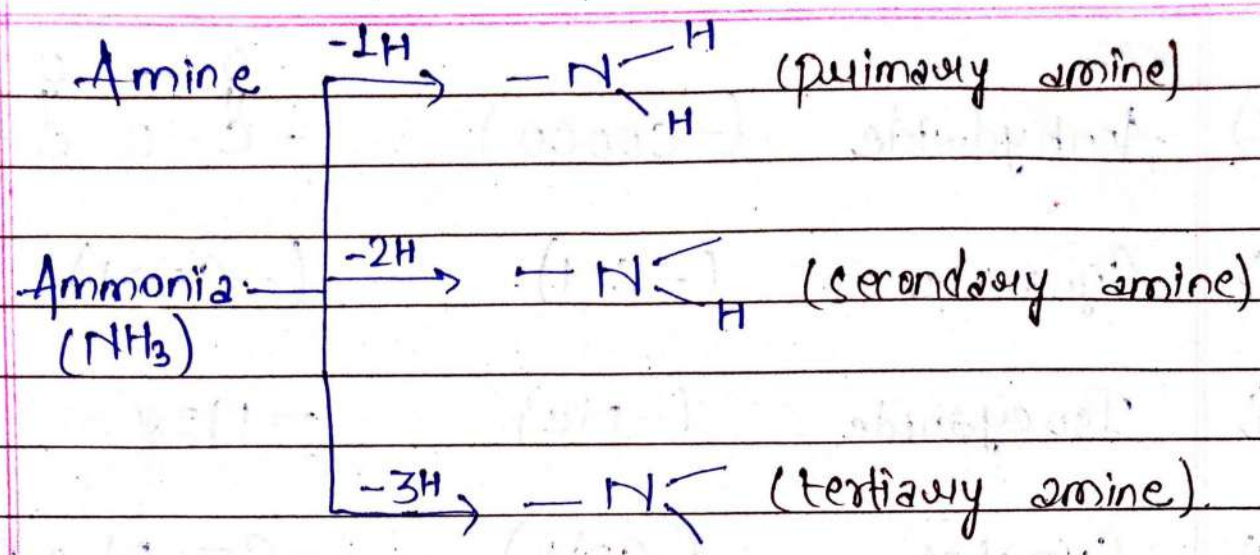
5) Halogen (-X) where, X = Cl, Br, I

6) Amide ($-CONH_2$) 

7) Ether (-O-)

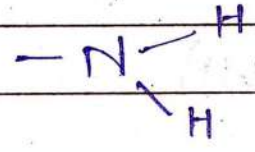
8) Ester (-COO) 

9) Amine

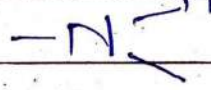


Amine.

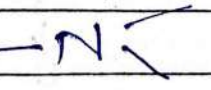
When 1 hydrogen is removed from ammonia then the remaining part of Ammonia is called Primary Amine.



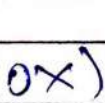
When 2 hydrogen is removed from ammonia then the remaining part of Ammonia is called Secondary Amine.

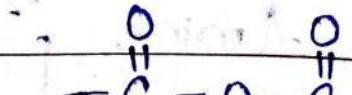


When 3 hydrogen is removed from ammonia then the remaining part of Ammonia is called tertiary Amine.



10) Acyl Halide (-COX)



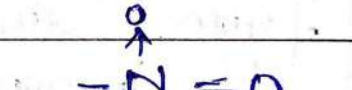
11) Anhydride (-COOCO) 

12) Cynamide (-CN) (-C≡N)

13) Isocyanide (-NC) -N≡C

14) Cynates (-CNO) -C≡N→O

15) Isocynates (-NCO) -N=C=O

16) Nitro ($-NO_2$) 

17) Oxime (-NOH) =N-O-H

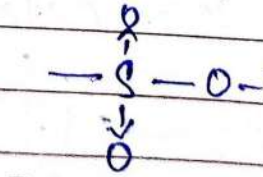
18) Azo ($-N_2$) -N=N-

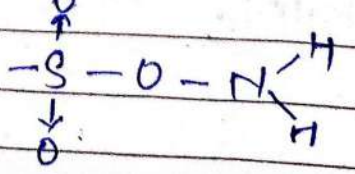
19) Nitrite (-ONO) -O-N=O-

20) Nitroso (-NO) -N=O

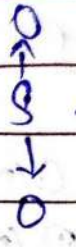
21) Thio-ether (sulphide) (S) -S-

22) Thio-Alcohol (Thios) (-SH) -S-H

23) Sulphonic Acid  (SO_3H)

24) Sulphonamide  ($-SO_2NH_2$)

25) Sulphonyl Chloride (SO_2Cl)



(1) Alcohol

$-O-H$ $(-OH)$

General formula :- $R-O-H$

$\Downarrow$

Alkyl group.

$\Rightarrow C_nH_{2n+1}-O-H$

Rule for nomenclature :-

Alkane $\xrightarrow[+ol]{-e}$ Alkanol.

Common name :- Alkyl Alcohol

n=1

CH_3OH. C/N $\Rightarrow$ Methyl Alcohol

or

(Wood alcohol)

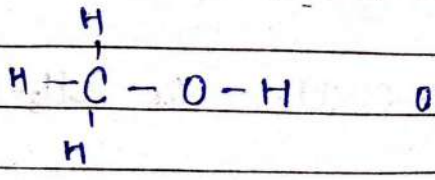
or

(Wood naph)

or

(Wood spirit)

I/N :- Methanol



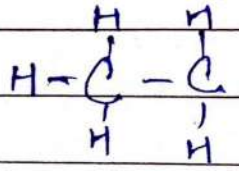
or CH_3-OH

$n = 2$

C_2H_5OH

C/N :- Ethyl Alcohol (grain alcohol).

I/N :- Ethanol.



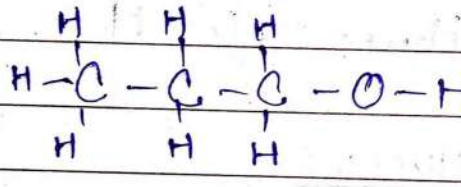
or, $CH_3 - CH_2 - OH$

$n = 3$

C_3H_7OH

C/N :- Propyl Alcohol

I/N :- Propanol



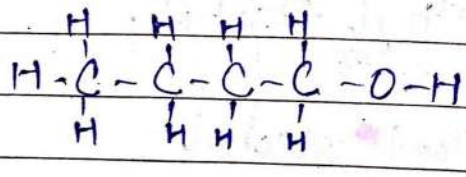
or $CH_3 - CH_2 - CH_2 - OH$

$n = 4$

C_4H_9OH

C/N :- Butyl Alcohol

I/N :- Butanol



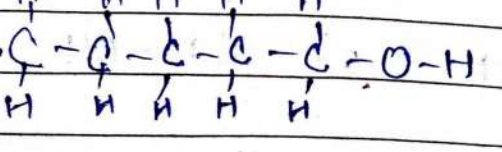
or $CH_3 - CH_2 - CH_2 - CH_2 - OH$

$n = 5$

$C_5H_{11}OH$

C/N :- Pentyl Alcohol

I/N :- Pentanol



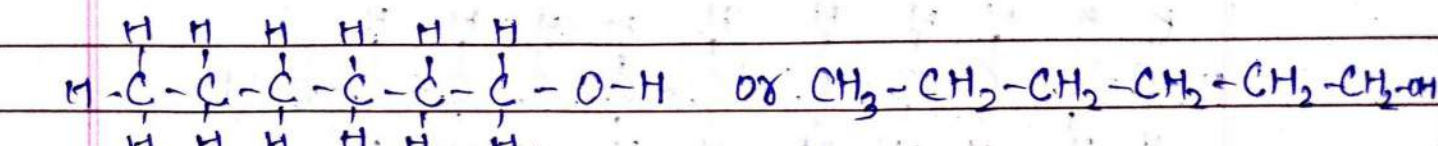
or $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - OH$

n = 6

$C_6H_{13}OH$

C/N :- Hexyl Alcohol

I/N :- ~~Per~~ hexanol

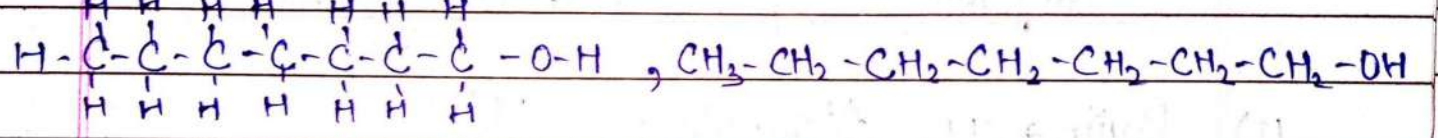


n = 7

$C_7H_{15}OH$

C/N :- Heptyl Alcohol

I/N :- Heptanol.

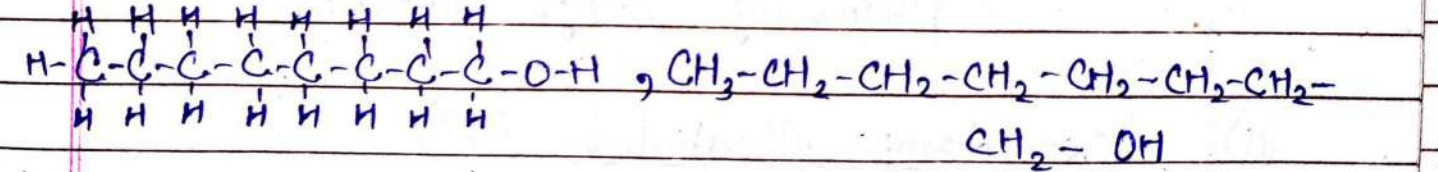


n = 8

$C_8H_{17}OH$.

C/N :- Octyl Alcohol

I/N :- Octanol

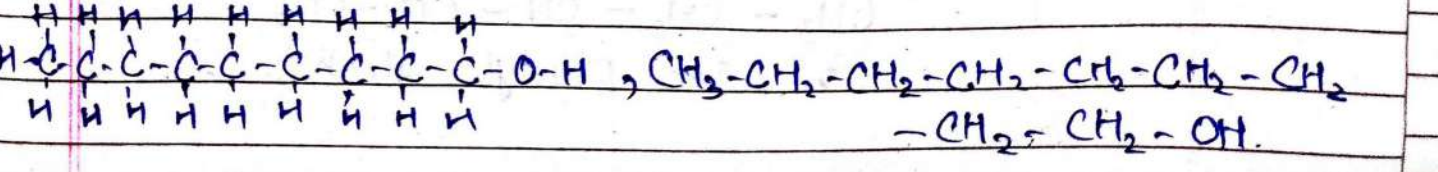


n = 9

$C_9H_{19}OH$

C/N :- Nonyl Alcohol

I/N :- Nonanol.

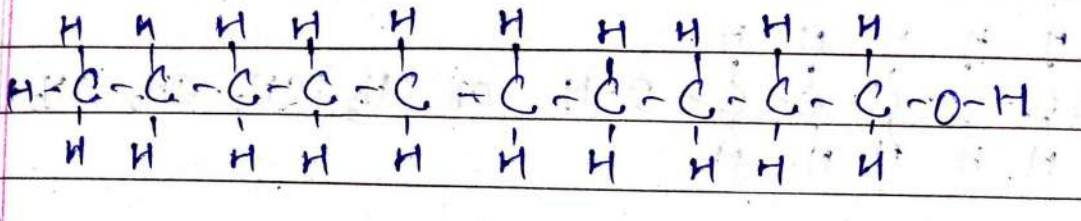


n=10

$C_{10}H_{21}OH$

C/N :- Decyl Alcohol

I/N :- Decanol



$CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-O$

❖ Types of alcohol on the basis of degree of carbon atom :-

(1) Primary Alcohol :- (1°)

When alcohol group is attached with primary carbon atom is called primary alcohol.

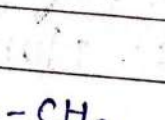
Ex :- $CH_3-CH_2-CH_2-CH_2-OH$

→ primary butyl alcohol.

(ii) Secondary Alcohol :- (2°)

When alcohol group is attached with secondary carbon atom is called primary alcohol.

Ex :-



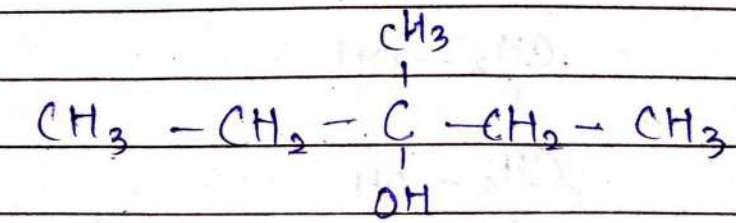
$CH_3-CH_2-CH-CH_2-CH_3$

→ Sec. pentyl alcohol.

Tertiary Alcohol :- (3°)

when alcohol group is attached with tertiary carbon atom is called tertiary Alcohol.

Ex :-



⇒ Tertiary hexyl alcohol.

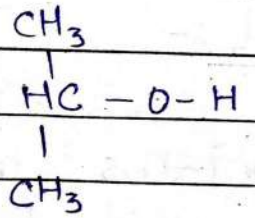
❖ Types of Alcohol on the basis of no. of OH group attached :-

(i) Mono-hydric alcohol
(ii) Di-hydric alcohol.
(iii) tri-hydric alcohol.
(iv) Poly hydric alcohol.

(i) Mono-hydric alcohol :-

Those cpds which contains one O-H group, is called mono-hydric alcohol.

Ex :-



⇒ Propan-2-ol
or
2-propanol.

2) Di- hydric Alcohol :-

Those cpds which contains two O-H group is called Di- hydric Alcohol.

$$\overset{1}{CH_2} - OH$$
$$|$$
$$\overset{2}{CH_2} - OH$$

⇒ Ethane 1,2 di - ol

or

glycol or peresterone

3) Tri- hydric Alcohol :-

Those cpds which contains three O-H group is called tri- hydric Alcohol.

$$\overset{1}{CH_2} - OH$$
$$|$$
$$\overset{2}{CH} - OH$$
$$|$$
$$\overset{3}{CH_2} - OH$$

⇒ propane 1, 2, 3 tri-ol.

or

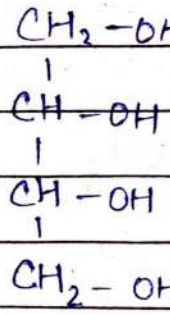
glycerol

or

glycerine.

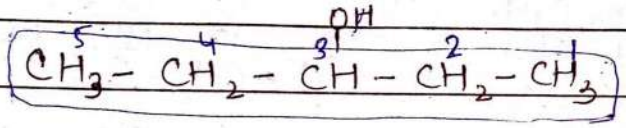
4) Poly- hydric Alcohol :-

Those cpds which contains more than 3 O-H group is called Poly- hydric. Alcohol.

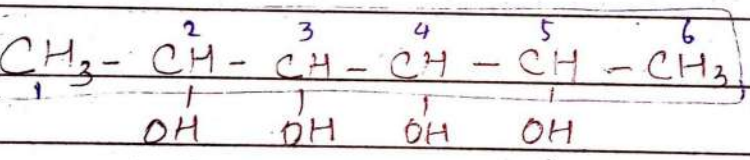
Ex:- 

→ Butane 1,2,3,4 tetra-ol.

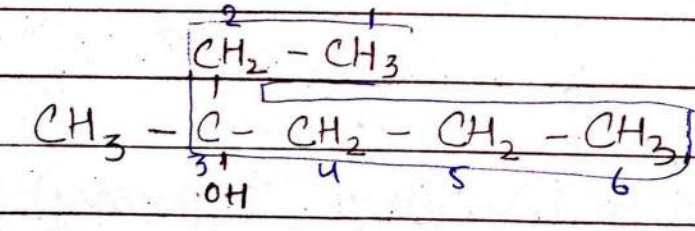
Q→ Write the common name and nomenclature of the following cpds.

1) 

C/N ⇒ Secondary penty alcohol
N/N ⇒ penten-3-ol

2) 

I/N ⇒ hexane 2,3,4,5 tetraol.

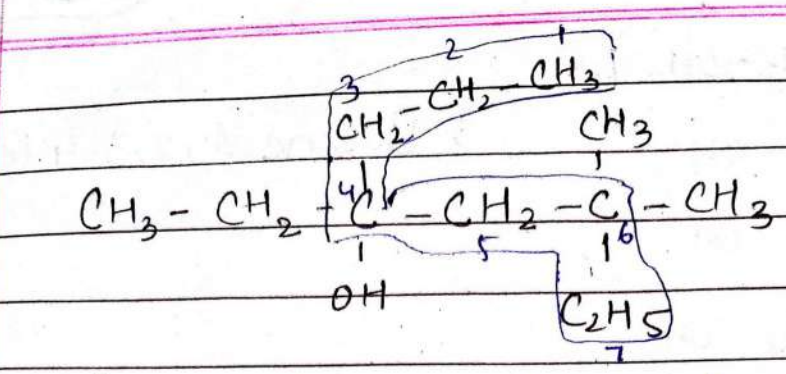
3) 

I/N ⇒ 3-methyl hexan-3-ol
C/N ⇒ tertiary heptyl alcohol.

4) C_4H_9OH → I/N = Butanol
C/N : Butyl alcohol.

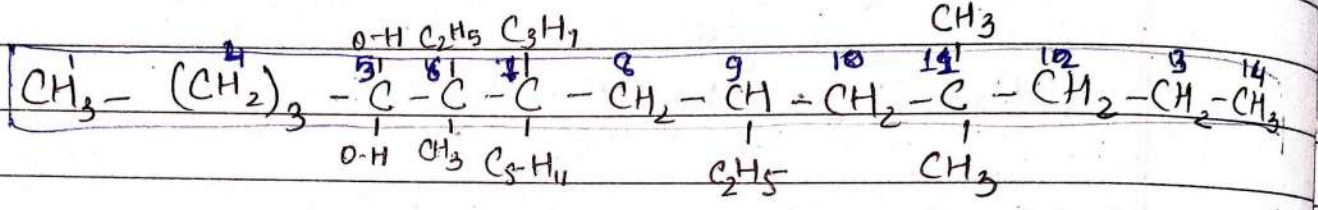
5) $C_7H_{15}OH$ → I/N : Heptanol
C/N : Heptyl alcohol.

6)



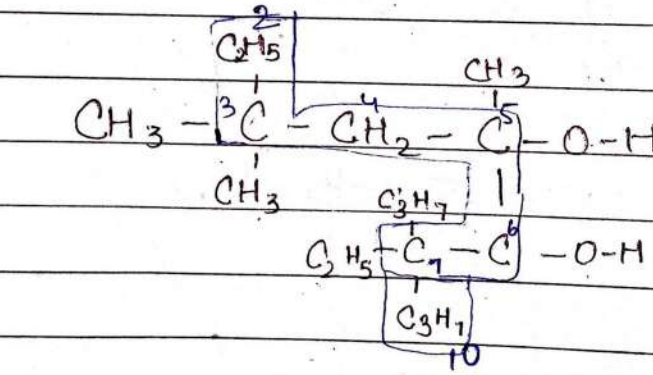
4 - ethyl 6,6 di-methyl octan - 4 - ol.

7)



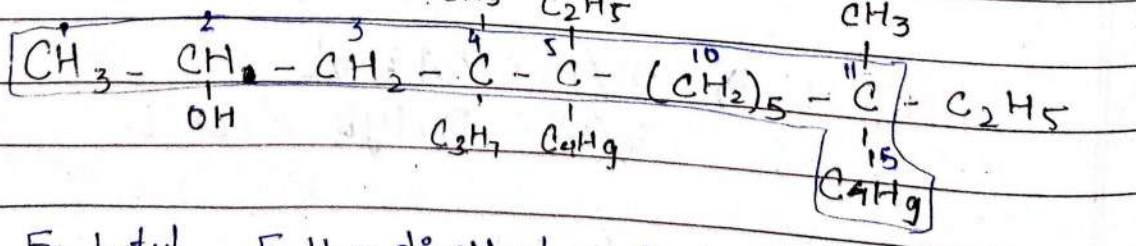
6,9 di-ethyl, 6,11,11 tri methyl, 7 pentyl, 7-propyl tetradecane 5,5 di-ol.

8)



7 ethyl, 3,3,5-tri-methyl, 7-propyl, Decane, 5,6 di-ol.

9)



5-butyl, 5,11-di-ethyl, 4,4, di-methyl, 4-propyl pentadecan-2-ol.

⟨2⟩ Ether (-O-)

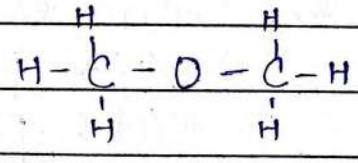
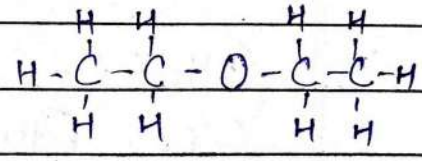
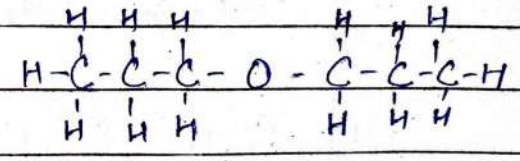
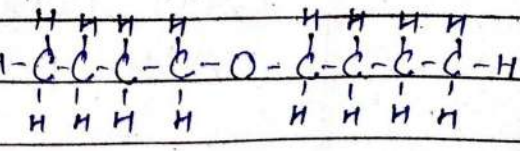
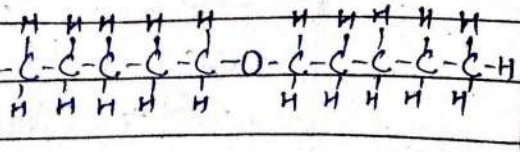
Simple

Structure :- R – O – R

Common name :- Di Alkyl Ether

Nomenclature :- Alkoxy Alkane

↓ Shortest chain ↓ Longest chain

	Common name	I/N	Structure
CH_3-O-CH_3	di methyl Ether	Methoxy Methane	
$C_2H_5-O-C_2H_5$	di ethyl Ether	Ethoxy Ethane	
$C_3H_7-O-C_3H_7$	di propyl Ether	Propoxy propane	
$C_4H_9-O-C_4H_9$	di butyl Ether	Butoxy butane	
$C_5H_{11}-O-C_5H_{11}$	di Pentyl Ether	Pentoxy pentane	

$CH_3-CH_2-CH_2-CH_2-CH_2-O-CH_2-CH_2-CH_2-CH_2-CH_3$

Mix

Structure :- R - O R'

Common name :- Alkyl Alkyl Ether

Nomenclature :- Alkoxy Alkane
↓ ↓
Shortest chain / longest chain

1) $CH_3 - O - C_3H_7$
C/N → Methyl methyl ether
I/N → Methoxy propane.

2) $C_3H_7 - O - C_5H_{11}$
C/N → pentyl propyl ether
I/N → propoxy pentane.

3) $C_2H_5 - O - C_7H_{15}$
C/N → Ethyl Heptyl Ether
I/N → Ethoxy heptane

4) $C_3H_7 - O - C_6H_{13}$
C/N → Hexyl propyl Ether
I/N → propoxy hexane.

5) $CH_3 - O - C_5H_{11}$
C/N → Methyl pentyl ether
I/N → Methoxy pentane.

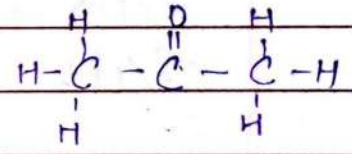
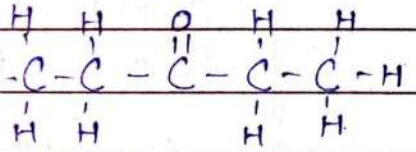
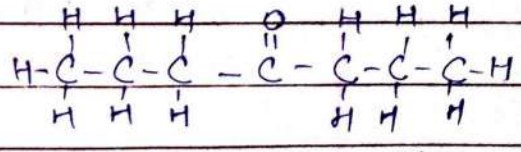
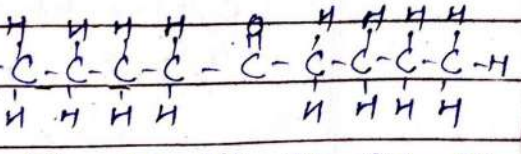
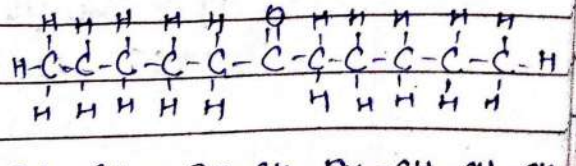
(3) Ketone $(-\overset{\overset{O}{\|}}{C}-)$

Simple

Structure :- $R-\overset{\overset{O}{\|}}{C}-R$

Common name :- di Alkyl Ketone

Nomenclature :- Alkane $\xrightarrow[+one]{-e}$ Alkanone

	Common name	I/N	Structure.
$CH_3-\overset{\overset{O}{\|}}{C}-CH_3$	di methyl ketone (Acetone)	Propanone	
			$\Rightarrow CH_3-CO-CH_3$
$C_2H_5-\overset{\overset{O}{\|}}{C}-C_2H_5$	di ethyl ketone	pentanone	
			$\Rightarrow CH_3-CH_2-CO-CH_2-CH_3$
$C_3H_7-\overset{\overset{O}{\|}}{C}-C_3H_7$	dipropyl ketone	Heptanone	
			$\Rightarrow CH_3-CH_2-CH_2-CO-CH_2-CH_2-CH_3$
$C_4H_9-\overset{\overset{O}{\|}}{C}-C_4H_9$	dibutyl ketone	Nonanone	
			$\Rightarrow CH_3-CH_2-CH_2-CH_2-CO-CH_2-CH_2-CH_2-CH_3$
$C_5H_{11}-\overset{\overset{O}{\|}}{C}-C_5H_{11}$	di-pentyl ketone	Undecanone	
			$\Rightarrow CH_3-CH_2-CH_2-CH_2-CH_2-CO-CH_2-CH_2-CH_2-CH_2-CH_3$

Mix

Structure :- $R-\overset{\overset{O}{\|}}{C}-R'$

Common name :- Alkyl Alkyl Ketone.

Nomenclature :- Alkanone.

1) $CH_3-\overset{\overset{O}{\|}}{C}-C_2H_5$

C/N → Ethyl methyl ketone

I/N → Pentanone.

2) $C_2H_5-\overset{\overset{O}{\|}}{C}-C_4H_9$

C/N → Butyl Ethyl ketone

I/N → Heptanone

3) $C_4H_9-\overset{\overset{O}{\|}}{C}-C_5H_{11}$

C/N → Butyl pentyl ketone

I/N → Decanone.

4) $C_2H_5-\overset{\overset{O}{\|}}{C}-C_5H_{11}$

C/N → Ethyl pentyl ketone

I/N → Octanone

5) $C_3H_7-\overset{\overset{O}{\|}}{C}-C_7H_{15}$

C/N → Heptyl Propyl ketone

I/N → undecanone.

6) $C_4H_9-\overset{\overset{O}{\|}}{C}-C_3H_7$

C/N → Butyl Propyl ketone

I/N → Octanone.

(4) Amine :-

(i) Primary Amine :-

St. :- $R-N(H)(H)$

Common name :- Alkyl primary amine.

I/N :- Alkane $\xrightarrow[+\text{amine}]{-e}$ Alkanamine.

(ii) Secondary Amine :- (Mix)

Structure :- $H-N(R)(R')$

Common name :- Alkyl Alkyl secondary Amine.

I/N :- Alkanamine.

(Simple)

Structure :- $H-N(R)(R)$

Common name :- Di-Alkyl secondary Amine

I/N :- Alkanamine.

(iii) Tertiary Amine :-

(Simple)

Structure :- $R-N(R)(R)$

C/N :- Tri Alkyl tertiary Amine

I/N :- Alkanamine.

(Mix)

Structure :- $R''-N<^{R}_{R'}$

C/N :- Alkyl Alkyl Alkyl tertiary Amin
I/N :- Alkanamine.

Q→1) $CH_3-N<^{CH_3}_{CH_3}$

C/N :- Tri methyl tertiary amine.
I/N :- Propanamine.

2) $C_5H_{11}-N<^{H}_{H}$

C/N :- Pentyl primary amine
I/N :- Pentanamine.

3) $C_3H_7-N<^{C_5H_{11}}_{C_8H_{17}}$

C/N :- Octyl pentyl propyl tertiary amine.
I/N :- hexadecanamine.

4) $H-N<^{C_2H_5}_{C_4H_9}$

C/N :- Butyl ethyl secondary amine
I/N :- Hexanamine.

5) $C_9H_{19}-N<^{H}_{H}$

C/N :- Nonayl ge Primary amine
I/N :- Nonanamine.

6) $C_4H_9 - N(-C_4H_9)(-C_2H_5)$

C/N :- Di-butyl ethyl tertiary amine.
I/N :- Decanamine

7) $H - N(-C_2H_5)(-H)$

C/N :- Ethyl primary amine
I/N :- Ethanamine.

8) $C_3H_7 - N(-CH_3)(-C_2H_5)$

C/N :- Ethyl methyl propyl tertiary amine.
I/N :- Hexanamine.

9) $H - N(-C_2H_5)(-C_2H_5)$

C/N :- di ethyl secondary amine
I/N :- Butanamine.

10) $C_3H_7 - N(-C_5H_{11})(-C_5H_{11})$

C/N :- di pentyl propyl tertiary amine
I/N :- Tritridecamine.

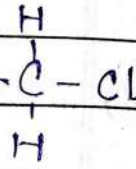
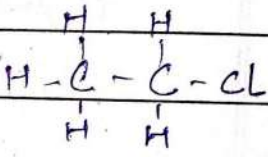
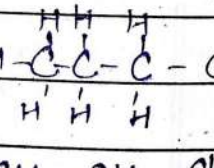
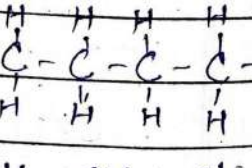
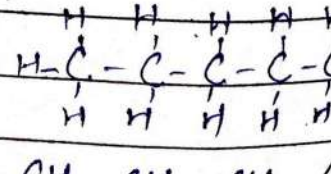
(5) Halogen :-

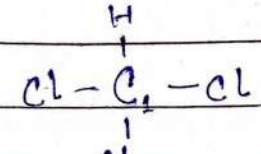
(X ⇒ Cl, Br, I)

Structure :- R – X

C/N :- Alkyl Halide

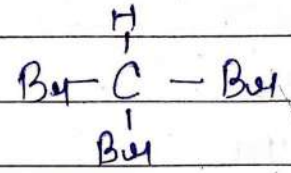
I/N :- Halo – Alkane.

	Common name	I/N	Structure.
CH_3Cl	Methyl chloride	Chloro methane	
C_2H_5Cl	Ethyl chloride	Chloro ethane	 CH_3-CH_2-Cl
C_3H_7Cl	Propyl chloride	Chloro propane	 $CH_3-CH_2-CH_2-Cl$
C_4H_9Cl	Butyl chloride	Chloro butane	 $CH_3-CH_2-CH_2-CH_2-Cl$
$C_5H_{11}Cl$	Pentyl chloride	Chloro Pentane	 $CH_3-CH_2-CH_2-CH_2-CH_2-Cl$

★ 

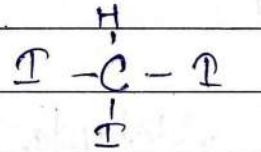
I/N :- 1,1,1 tri chloro methane

C/N :- Chloroform.

★ 

I/N :- 1,1,1 tri- bromo methane.

C/N :- Bromoform.

★ 

I/N :- 1,1,1 tri - Iodo metane.

C/N :- Iodoform

(6) Aldehyde :-

Rule for common name :-

$n=0$, H → form
$n=1$, CH_3 → Acet
$n=2$, C_2H_5 → Butyr Propion
$n=3$, C_3H_7 → ~~Valyr~~ Butyr
$n=4$, C_4H_9 → ~~Capro~~ Valyr
$n=5$, C_5H_{11} → Capro

General formula :- $R-\overset{O}{\overset{\|}{C}}-H$

C/N :- Common name +aldehyde
I/N :- Alkane $\xrightarrow[+al]{-e}$ Alkanal.

	Common name	I/N	Structure.
$n=0$	formaldehyde	Methanal	$H-\overset{O}{\overset{\|}{C}}-H$
$n=1$	Acetaldehyde	Ethanal	$CH_3-\overset{O}{\overset{\|}{C}}-H$
$n=2$	propionaldehyde	Propanal	$C_2H_5-\overset{O}{\overset{\|}{C}}-H$
$n=3$	Butyraldehyde	Butanal	$C_3H_7-\overset{O}{\overset{\|}{C}}-H$
$n=4$	Valeraldehyde	Pentanal	$C_4H_9-\overset{O}{\overset{\|}{C}}-H$
$n=5$	Caproaldehyde	Hexanal	$C_5H_{11}-\overset{O}{\overset{\|}{C}}-H$

⟨7⟩ Carboxylic Acid or Acid :-

Rule for common name :-

n = 0 , H → form
n = 1 , CH_3 → Acet
n = 2 , C_2H_5 → Butyr Propion
n = 3 , C_3H_7 → Valyr Butyr
n = 4 , C_4H_9 → Caproic. Valyr
n = 5 C_5H_{11} → Caproic

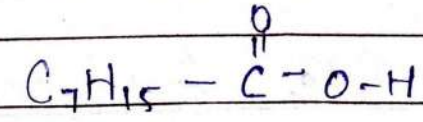
General formula :- $R-\overset{O}{\overset{\|}{C}}-O-H$

C/N :- Common name + ic
I/N :- Alkane $\xrightarrow[+\text{oic Acid}]{-e}$ Alkanoic acid.

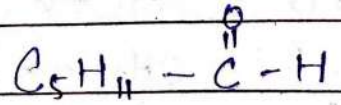
	Common name	I/N	Structure
n=0	formic acid	Methanoic acid	$H-\overset{O}{\overset{\|}{C}}-O-H$
n=1	Acetic acid	Ethanoic acid	$CH_3-\overset{O}{\overset{\|}{C}}-O-H$
n=2	Propionic acid	Propanoic acid	$C_2H_5-\overset{O}{\overset{\|}{C}}-O-H$
n=3	Butyric acid	Butanoic acid	$C_3H_7-\overset{O}{\overset{\|}{C}}-O-H$
n=4	Valyric acid	Pentanoic acid	$C_4H_9-\overset{O}{\overset{\|}{C}}-O-H$
n=5	Caproic acid	Hexanoic acid	$C_5H_{11}-\overset{O}{\overset{\|}{C}}-O-H$

Ques:- Write the structure of following compound

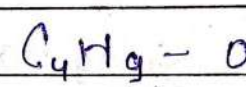
1) Octanoic acid



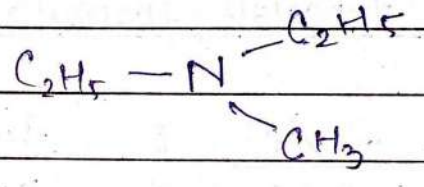
2) Hexanal



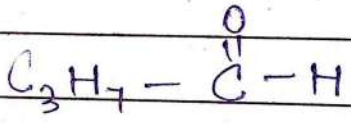
3) butanol



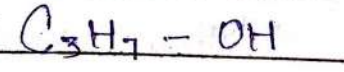
4) Penta amine



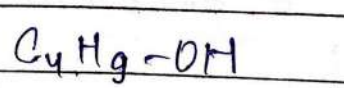
5) Butyraldehyde



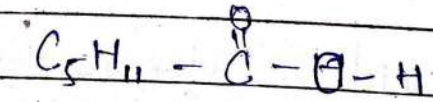
6) Propanol



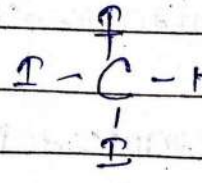
7) Butanol



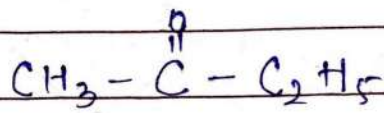
8) Caproic Acid



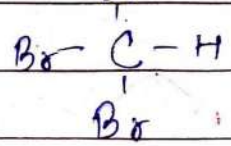
9) Iodoform



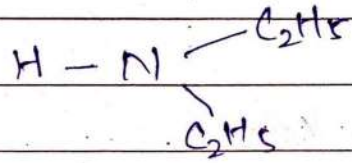
10) Butanone



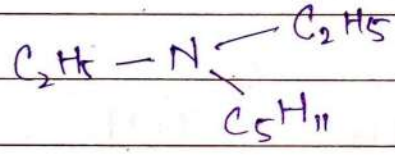
11) Bromoform



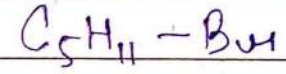
12) Butanamine.



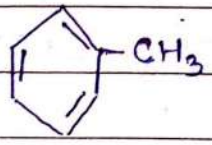
13) di ethyl pentyl tertiary amine.



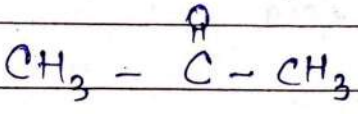
14) Bromo pentane.



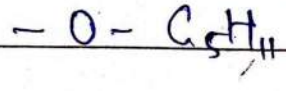
15) Toluene



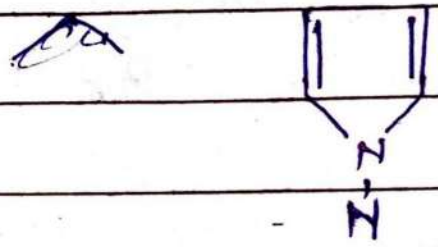
16) Acetone



17) Dipropoxy pentane.



Pyrrole Pyrrole



Ethyl methyl Ketone

$C_2H_5 - \overset{O}{\overset{\|}{C}} - CH_3$

Ethanoic Acid.

$CH_3 - \overset{O}{\overset{\|}{C}} - O - H$

Propanal

$C_2H_5 - \overset{O}{\overset{\|}{C}} - H$

hexan amine

$CH_3 - N(C_2H_5)(C_3H_7)$

Methanoic Acid.

$H - \overset{O}{\overset{\|}{C}} - O - H$

(8) Esters :-

Organic Esters :-

Structure :- $R-\overset{O}{\overset{\|}{C}}-O-R'$

C/N :- $R-\overset{O}{\overset{\|}{C}}-O-R$

- form (0)
- Acet (1)
- Propion (2)
- Butyr (3)
- Valyr (4)
- Capro (5)

Alkyl

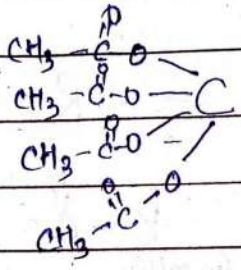
⇒ Alkyl - R + ate

I/N :- Alkyl Alkanoate.

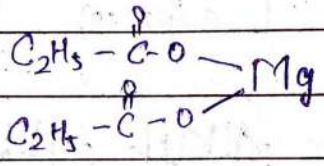
C/N	I/N	Structure
Methyl formate	Methyl methanoate	$H-\overset{O}{\overset{\|}{C}}-O-CH_3$
Methyl Acetate	Methyl ethanoate	$CH_3-\overset{O}{\overset{\|}{C}}-O-CH_3$
Butyl propionate	Butyl propanoate	$C_2H_5-\overset{O}{\overset{\|}{C}}-O-C_4H_9$
Butyl Butyrate	Butyl butanoate	$C_3H_7-\overset{O}{\overset{\|}{C}}-O-C_4H_9$
Propyl Valyrate	Propyl pentanoate	$C_4H_9-\overset{O}{\overset{\|}{C}}-O-C_3H_7$
Ethyl caproate	Ethyl hexanoate.	$C_5H_{11}-\overset{O}{\overset{\|}{C}}-O-C_2H_5$

Inorganic Esters

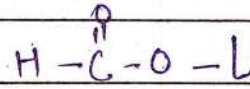
1) Carbon ethanoate.



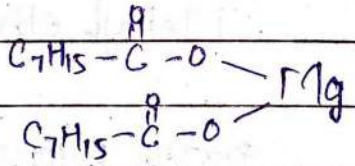
2) Magnesium propionate



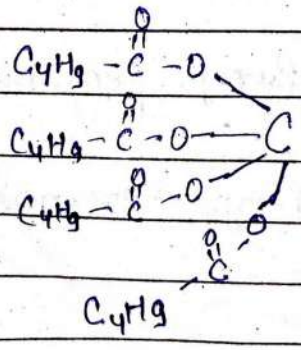
3) Lithium formate.



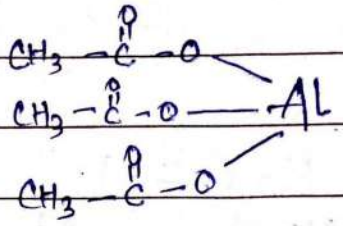
4) Magnesium Octanoate.



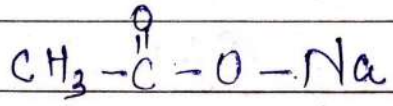
5) Carbon valerate.



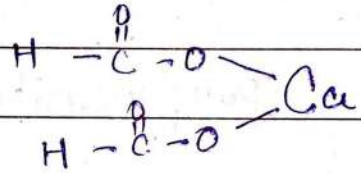
6) Aluminium Ethanoate.



7) Sodium Acetate.



8) Calcium methanoate.



(9) Cyanide :-

Structure :- $R-C\equiv N$

C/N :- Alkyl cyanide

I/N :- Alkane Nitrile.

	C/N	I/N	Structure
n=1	Methyl cyanide	Ethane Nitrile	CH_3-CN
n=2	Ethyl cyanide	Propanenitrile	$C_2H_5-C\equiv N$
n=3	Propyl cyanide	Butanenitrile	$C_3H_7-C\equiv N$
n=4	Butyl cyanide	Pentanenitrile	$C_4H_9-C\equiv N$
n=5	Pentyl cyanide	Hexanenitrile	$C_5H_{11}-C\equiv N$
n=6	Hexyl cyanide	Heptanenitrile	$C_6H_{13}-C\equiv N$
n=7	Heptyl Cyanide	Octanenitrile	$C_7H_{15}-C\equiv N$
n=8	Octyl Cyanide	Nonanenitrile	$C_8H_{17}-C\equiv N$
n=9	Nonyl Cyanide	Undecane nitrile	$C_9H_{19}-C\equiv N$
n=10	decyl Cyanide	Undecane nitrile	$C_{10}H_{21}-C\equiv N$
n=0	Hydrogen Cyanide	Methane nitrile	$H-CN$

(10) Iso cyanide :-

Structure :- $R-N\equiv C$

Common name :- Alkyl isocyanide

C/N	Structure.
Methyl isocyanide	$CH_3-N\equiv C$
Ethyl isocyanide	$C_2H_5-N\equiv C$
Propyl isocyanide	$C_3H_7-N\equiv C$
Butyl isocyanide	$C_4H_9-N\equiv C$
Pentyl isocyanide	$C_5H_{11}-N\equiv C$
hexyl isocyanide	$C_6H_{13}-N\equiv C$
heptyl isocyanide	$C_7H_{15}-N\equiv C$
Octyl isocyanide	$C_8H_{17}-N\equiv C$
Nonyl isocyanide	$C_9H_{19}-N\equiv C$
Decyl isocyanide	$C_{10}H_{21}-N\equiv C$

(11) Cynates :-

Structure :- $R-C\equiv N\rightarrow O$

C/N :- Alkyl cynates

C/N	Structure.
Methyl cynates	$CH_3-C\equiv N\rightarrow O$
Ethyl cynates	C_2H_5-CNO
Propyl cynates	C_3H_7-CNO
Butyl cynates	C_4H_9-CNO
Pentyl cynates	$C_5H_{11}-CNO$
Hexyl cynates	$C_6H_{13}-CNO$
Heptyl cynates	$C_7H_{15}-CNO$
Octyl cynates	$C_8H_{17}-CNO$
Nonyl cynates	$C_9H_{19}-CNO$
Decyl cynates	$C_{10}H_{21}-CNO$

(12) Iso cynates :-

Structure :- $R-N=C=O$

C/N :- Alkyl isocynates.

C/N	Structure
Methyl isocynates	$CH_3-N=C=O$
Ethyl isocynates	C_2H_5-NCO
Propyl isocyanates	C_3H_7-NCO
Butyl isocyantes	C_4H_9-NCO
Pentyl isocynates	$C_5H_{11}-NCO$
Hexyl isocynates	$C_6H_{13}-NCO$
Heptyl isocynates	$C_7H_{15}-NCO$
Octyl isocynates	$C_8H_{17}-NCO$
Nonyl isocynates	$C_9H_{19}-NCO$
Decyl isoynates	$C_{10}H_{21}-NCO$

(13) Nitro :-

Structure :- $R-\overset{\overset{O}{\uparrow}}{N}=O$

I/N :- Nitro Alkane.

I/N	Structure
Nitro methane	$CH_3-\overset{\overset{O}{\uparrow}}{N}=O$
Nitro Ethane	$C_2H_5-NO_2$
Nitro propane	$C_3H_7-NO_2$
Nitro Butane	$C_4H_9-NO_2$
Nitro Pentane	$C_5H_{11}-NO_2$
Nitro Hexane	$C_6H_{13}-NO_2$
Nitro Heptane	$C_7H_{15}-NO_2$
Nitro Octane	$C_8H_{17}-NO_2$
Nitro Nonane	$C_9H_{19}-NO_2$
Nitro Decane	$C_{10}H_{21}-NO_2$

(14) Thiols Ethers or Sulphide

Simple

Structure :- R - S - R

C/N :- di Alkyl sulphide

C/N	Structure
dimethyl sulphide	$CH_3 - S - CH_3$
diethyl sulphide	$C_2H_5 - S - C_2H_5$
di propyl sulphide	$C_3H_7 - S - C_3H_7$
di butyl sulphide	$C_4Hg - S - C_4Hg$
di pentyl sulphide	$C_5H_{11} - S - C_5H_{11}$

Mix

Structure :- R - S - R'

C/N :- Alkyl Alkyl sulphide

1) $CH_3 - S - C_3H_7$ ⇒ Methyl propyl sulphide

2) $C_3H_7 - S - C_5H_{11}$ ⇒ Pentyl propyl sulphide

3) $C_2H_5 - S - C_4Hg$ → Butyl ethyl sulphide

4) $C_6H_{13} - S - CH_3$ → Hexyl methyl sulphide.

(15) Thiols Alcohol :-

Structure :- R - S-H

C/N :- Alkyl mercaptan

C/N	Structure
Methyl mercaptan	$CH_3 - S - H$
Ethyl mercaptan	$C_2H_5 - S - H$
Propyl mercaptan	$C_3H_7 - S - H$
Butyl mercaptan	$C_4H_9 - S - H$
Pentyl mercaptan	$C_5H_{11} - S - H$
Hexyl mercaptan	$C_6H_{13} - S - H$
Heptyl mercaptan	$C_7H_{15} - S - H$
Octyl mercaptan	$C_8H_{17} - S - H$
Nonyl mercaptan	$C_9H_{19} - S - H$
Decyl mercaptan	$C_{10}H_{21} - S - H$

(16) Annhydride :-

Simple

Structure :- $R-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-R$

n = 0, form
n = 1, Acet
n = 2, propion
n = 3, butyr
n = 4, valyr
n = 5, Caproo

Common name :- di C/Nic annhydride.

C/N	Structure.
di formic annhydride	$H-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-H$
di AceHc annhydride.	$CH_3-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_3$
di propionic annhydride	$C_2H_5-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-C_2H_5$
di butyric annhydride.	$C_3H_7-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-C_3H_7$
di valyric annhydride.	$C_4H_9-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-C_4H_9$
di Caproic annhydride.	$C_5H_{11}-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-C_5H_{11}$

Mix

1) $H-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_3$

C/N → Acetic formic anhydride

2) $C_2H_5-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-CH_3$

C/N → Acetic propionic anhydride

3) $C_4H_9-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-H$

C/N → formic Valyric anhydride

4) $C_5H_{11}-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-C_2H_5$

→ C/N → Caproic propionic anhydride

5) $C_3H_7-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-C_5H_{11}$

C/N → Butyric Caproic anhydride

6) $CH_3-\overset{O}{\overset{\|}{C}}-O-\overset{O}{\overset{\|}{C}}-C_5H_{11}$

C/N → Acetic Caproic anhydride.

(17) Nitrile :-

Structure :- $R-O-N=O$

C/N :- Alkyl Nitrile.

C/N	Structure.
Methyl Nitrile	$CH_3-O-N=O$
Ethyl Nitrile	$C_2H_5-O-N=O$
Propyl Nitrile	$C_3H_7-O-N=O$
Butyl Nitrile	$C_4H_9-O-N=O$
Pentyl Nitrile	$C_5H_{11}-O-N=O$
Hexyl Nitrile	$C_6H_{13}-O-N=O$
Heptyl Nitrile	$C_7H_{15}-O-N=O$
Octyl Nitrile	$C_8H_{17}-O-N=O$
Nonyl Nitrile	$C_9H_{19}-O-N=O$
Decayl Nitrile	$C_{10}H_{21}-O-N=O$

(18) Nitroso :-

Structure :- $R-N=O$

C/N :- Alkyl Nitroso

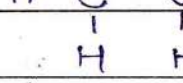
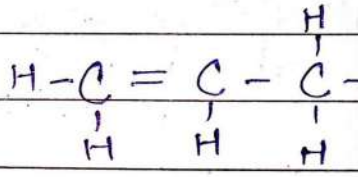
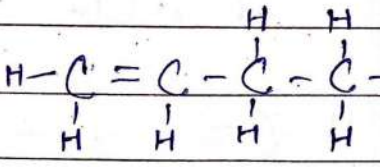
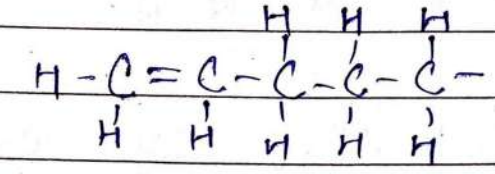
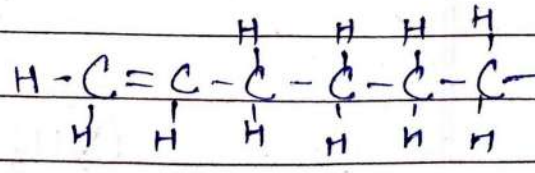
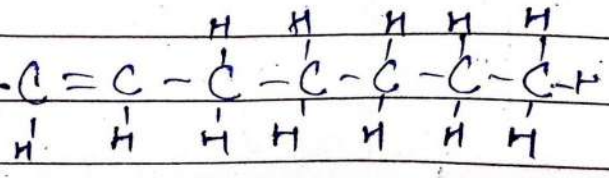
C/N	Structure
Methyl nitroso	$CH_3-N=O$
Ethyl nitroso	$C_2H_5-N=O$
Propyl nitroso	$C_3H_7-N=O$
Butyl nitroso	$C_4H_9-N=O$
Pentyl nitroso	$C_5H_{11}-N=O$
Hexyl nitroso	$C_6H_{13}-N=O$
Heptyl nitroso	$C_7H_{15}-N=O$
Octyl nitroso	$C_8H_{17}-N=O$
Nonyl nitroso	$C_9H_{19}-N=O$
Decyl nitroso	$C_{10}H_{21}-N=O$

Alkenyl Group

When one hydrogen is removed from alkene, then the remaining part of alkene is called alkenyl.

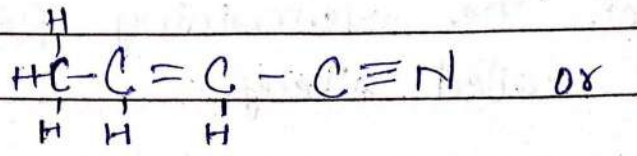
Alkene $\xrightarrow{-1H}$ Alkenyl

$C_nH_{2n} \xrightarrow{-1H} C_nH_{2n-1}$

C/N	Structure
Ethenyl (C_2H_3) or Vinyl	
Propenyl (C_3H_5) or Allyl	
Butenyl (C_4H_7) or Crotyl	
Pentenyl (C_5H_9)	
Hexenyl (C_6H_{11})	
Heptenyl (C_7H_{13})	

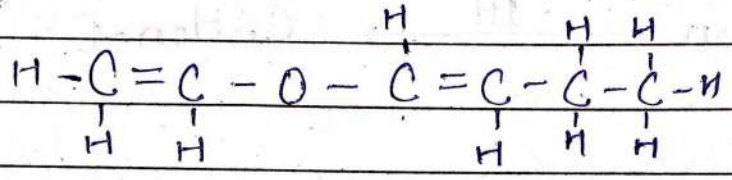
Ques. Write the structure of following compound:-

1) Allyl cyanide



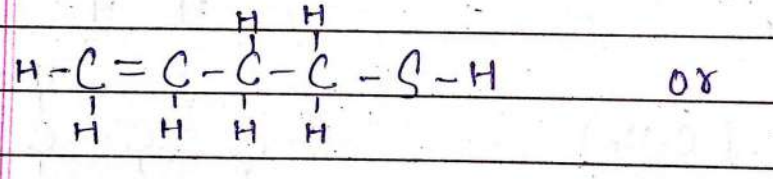
or C_3H_5-CN

2) Vinyl crotyl ether



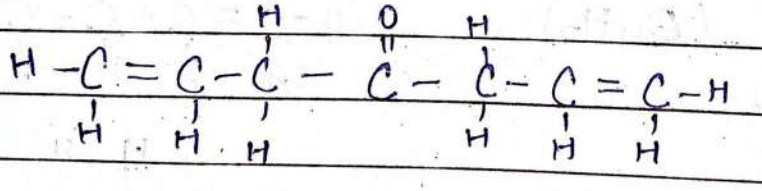
or $C_2H_3-O-C_4H_7$

3) Crotyl mercapton



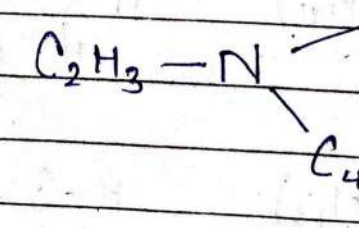
or C_4H_7-SH

4) di allyl ketone



or $C_3H_5-CO-C_3H_5$

5) Allyl Vinyl crotyl Tertiary amine.



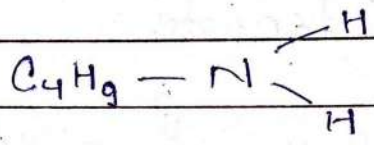
6) Ethane nitrile.

$C_2H_5 - O - N = O$

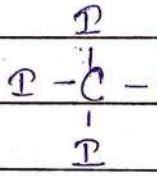
7) Urea

$NH_2 - CO - NH_2$ or $CO(NH_2)_2$

8) Butanamine

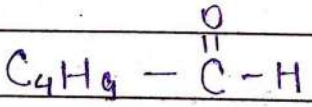


9) Iodoform



or ~~CHI_3~~ CHI_3

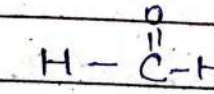
10) Valyraldehyde



11) Acetone.

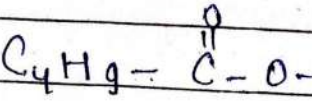
$CH_3 - CO - CH_3$

12) Methanal



or $H - CHO$

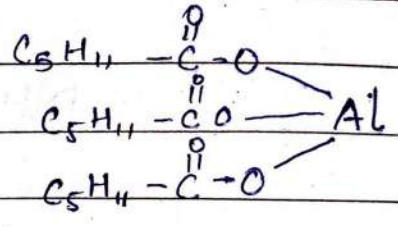
13) Pentanoic acid



14) Butoxy Hexane.

$$C_4H_9 - O - C_6H_{13}$$

15) Aluminium caprylate



16) Methyl butanoate

$$C_3H_7 - \overset{O}{\overset{\|}{C}} - O - CH_3$$

17) Bromo propane

$$C_3H_7 - Br$$

18) Nitro ethane

$$C_2H_5 - \overset{O}{\overset{\uparrow}{N}}=O \quad \text{or} \quad C_2H_5 - NO_2$$

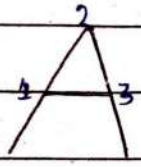
19) Allyl mercaptan

$$C_3H_7 - S - H$$

20) formic acetic anhydride.

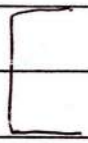
$$H - \overset{O}{\overset{\|}{C}} - O - C - CH_3$$

Bond line Notation



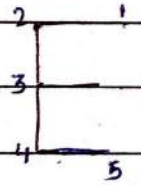
⇒ 1, 3 dimetyl cyclo propane.

⇒ di cyclo butane.

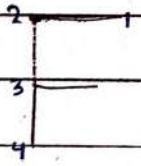


⇒ butane

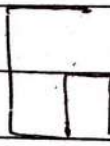
⇒ Cyclo butane.



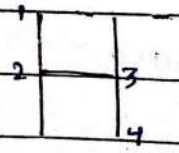
⇒ 3 methyl pentane.



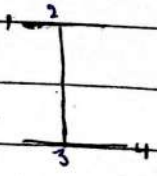
⇒ 3 methyl butane



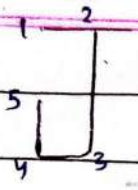
⇒ Heptane.



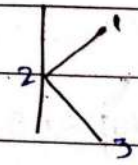
⇒ 2, 3 dimethyl butane.



⇒ 2, 3 dimethyl butane

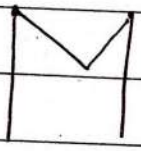


→ 2 methyl pentane



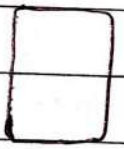
→ 2,2 di methyl propane

→ propane

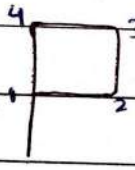


→ pentane

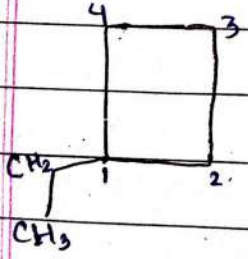
→ butane



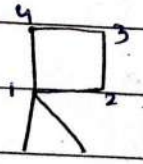
→ Cyclo butane



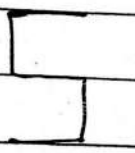
→ 1 methyl cyclobutane



→ 1 ethyl cyclobutane



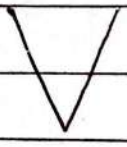
→ 1,1 di methyl cyclobutane



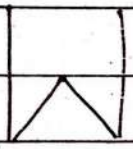
→ Hexane.

→ 2, methyl propane

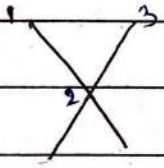
→ Butane



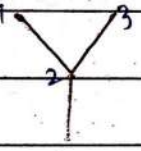
→ propane.



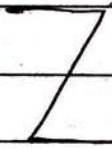
→ pentane



→ 2, 2, dimethyl propane



→ 2 methyl propane

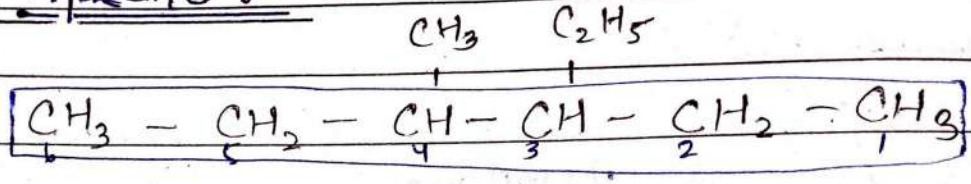


→ Butane

Nomenclature of organic cpds:

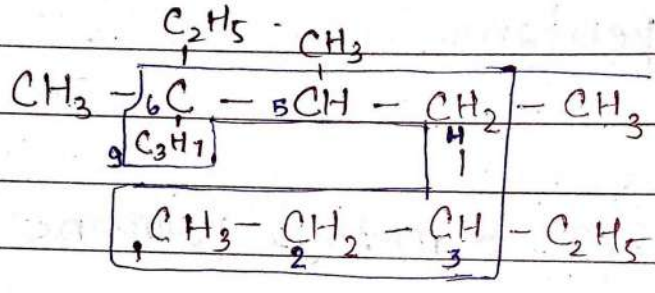
Alkane :-

1)



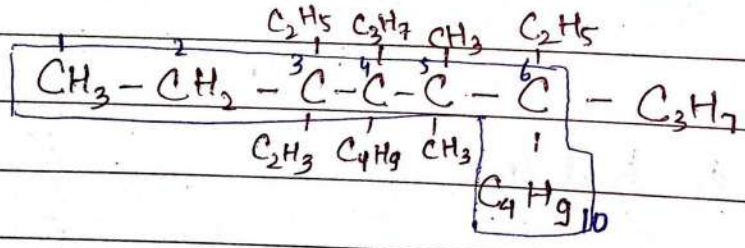
⇒ 3-ethyl 4-methyl hexane.

2)



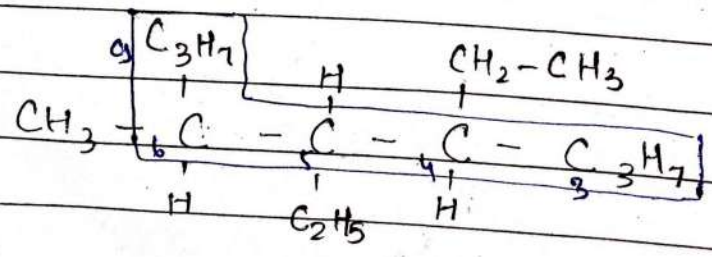
⇒ 3,6 di ethyl 4,5,6 tri methyl Nonane.

3)

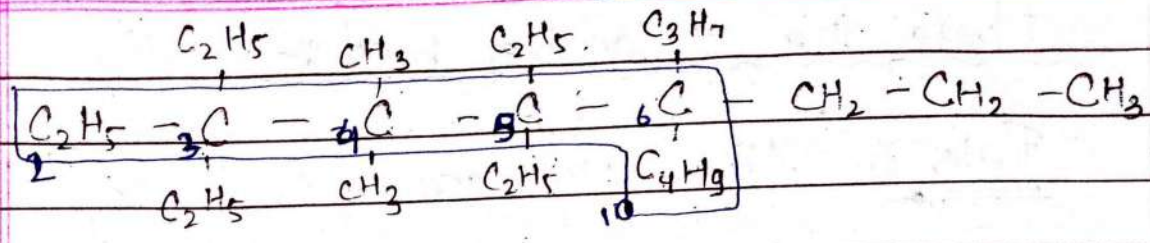


4-butyl 3,3,6 tri ethyl 5,5 dimethyl 4,6 di propyl decane.

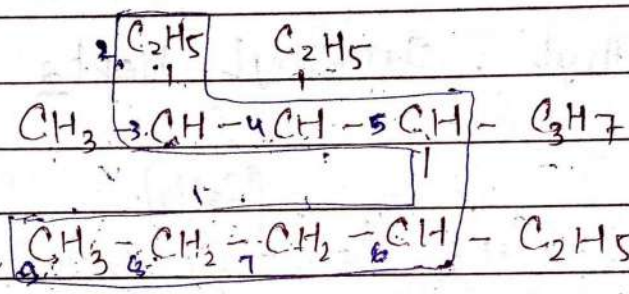
4)



4,5 di ethyl 6-methyl Nonane.

3) 

⇒ 3,3,5,5-tetra ethyl, 4,4-di methyl 6,6-di propyl. Decane.

6) 

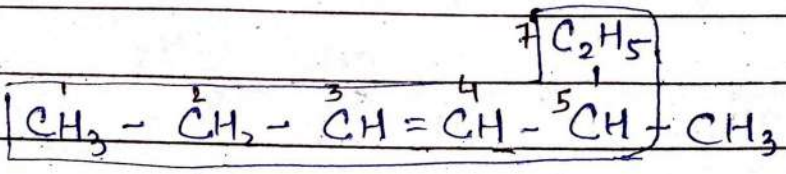
⇒ 4,6-di ethyl, 3-methyl, 5-propyl Nonane.

Alkene :-

Rule :- Alk - x - ene

⇓

Position of double bond

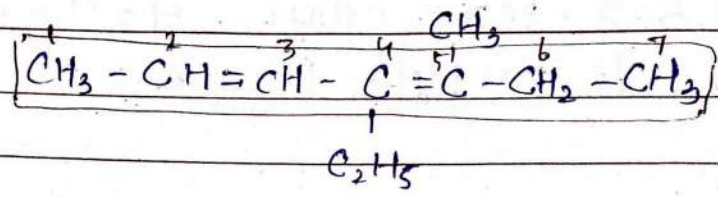
Ex :- 

⇒ 5-methyl, hept-3-ene.

More than 1 double bond :-

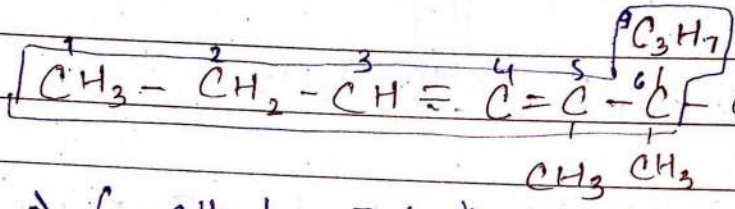
Rule :- Alka - x - ene.

Ex :-



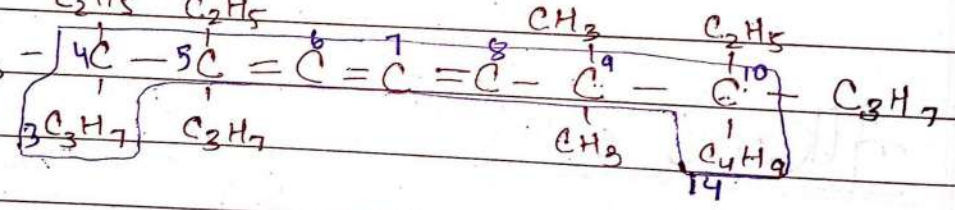
→ 4-ethyl, 5-methyl hepta 2,4 di-ene.

1)



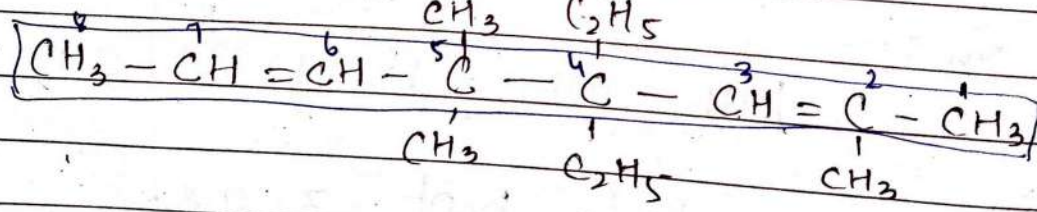
→ 6-ethyl, 5,6-dimethyl nona 3,4 di-ene.

2)



→ 4,5,10-triethyl, 4,9,9-trimethyl 5,10-di-propyl tetradeca 5,6,7,8 tri-ene.

3)



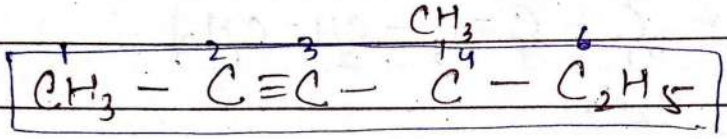
→ 4,4,-diethyl, 2,5,5-trimethyl octa 2,6 di-ene.

Alkyne :—

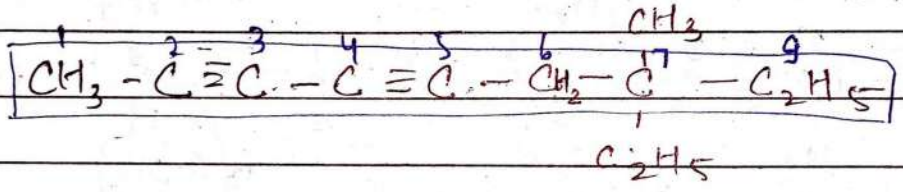
Rule :— Alk - Z - yne

↓↓

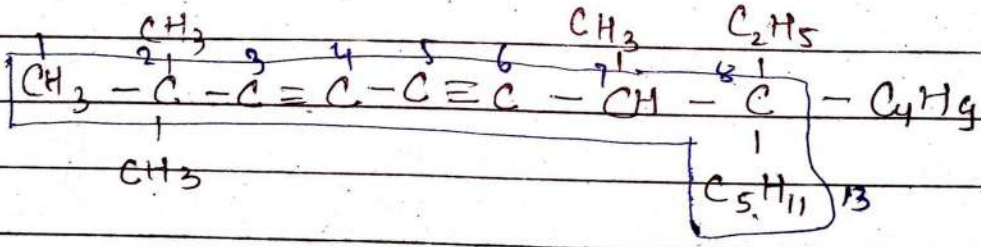
triple bond position.

1) 

→ 4-methyl, hex-2-yne.

2) 

→ 7-ethyl, 7-methyl Nona 2,4-di-yne

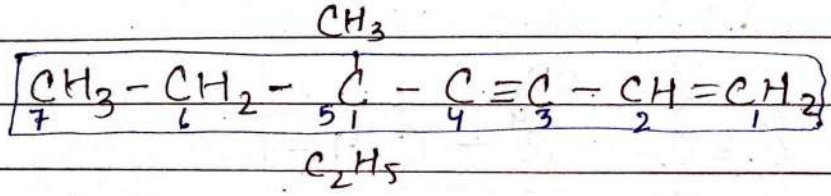
3) 

→ ~~8~~ 8-ethyl

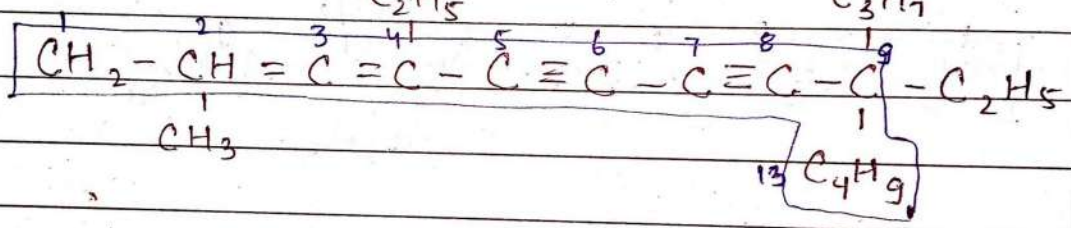
→ 8-butyl, 8-ethyl, 2,2,7-tri-methyl tridec-3,5-di-yne.

Mix

Rule :- Alk - x - en - Z-yne
(=) (≡)

1) 

⇒ 5-ethyl, 5-methyl hept-1-en 3-yne.

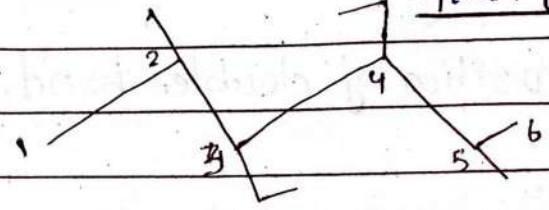
2) 

⇒ 4,9-diethyl, 2-methyl, 9-propyl ~~tetra~~ trideca 2,3 di ene 5,7 di-yne.

Nomenclature for Bond line Notation:

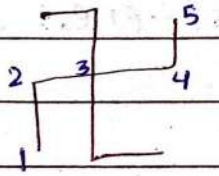
Alkane (ane)

1)



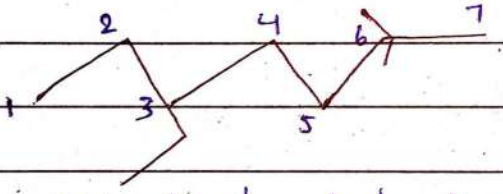
⇒ 3,4 diethyl 2,5 di-methyl hexane.

2)



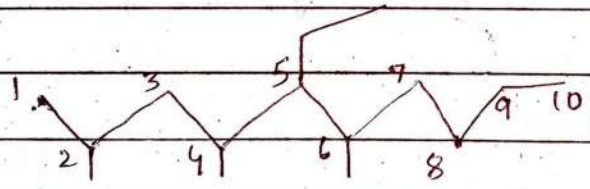
⇒ 3,3 di-ethyl pentane.

3)



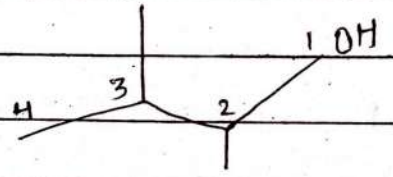
⇒ 3-ethyl 6,6 dimethyl heptane.

4)



5-ethyl 2,4,6 tri-methyl decane.

5)



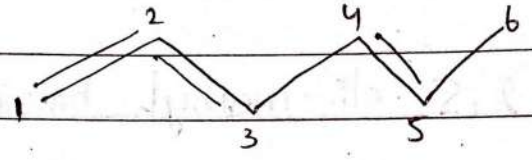
2,3 di-methyl butane 1-ol.

Alkene (-ene)

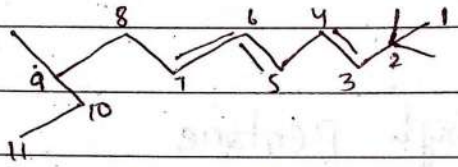
Rule :- Alkyl - X - ene

⇓

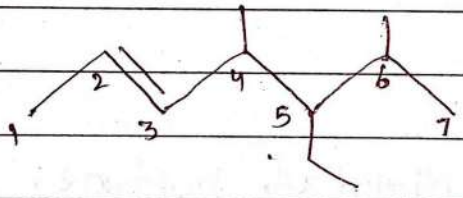
Position of double bond.

1) 

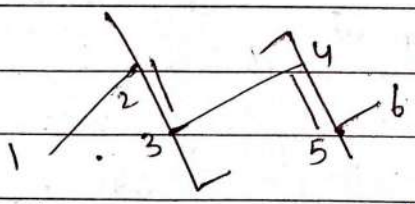
⇒ hexa 1,2,4 tri-ene.

2) 

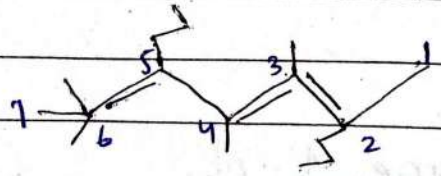
⇒ Deca 2,2,9 tri methyl 3,5,6 tri-ene.

3) 

⇒ 5-ethyl 4,6 di-methyl hept-2-ene.

4) 

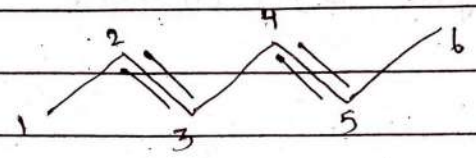
⇒ 3,4 di-ethyl · 2,5 di methyl hexa-2,4-ene

5) 

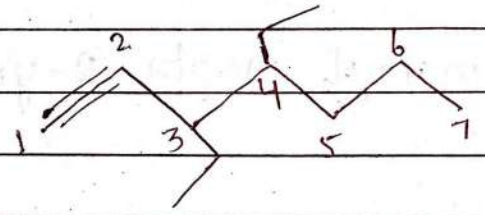
⇒ 2,5-di-ethyl 3,4,6,6-tetra methyl Hepta 2,3,5-tri-ene.

Alkyne (-yne)

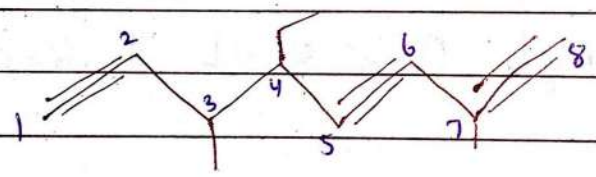
Rule:- Alkyl - x - yne
⇓
position of triple bond.

1) 

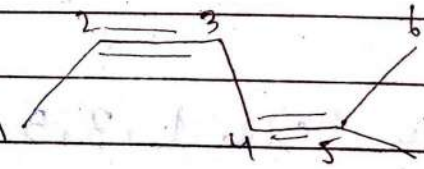
⇒ hexa 2,4 - ~~dy~~ di-yne.

2) 

⇒ 3,4 di-ethyl hept 1-yne.

3) 

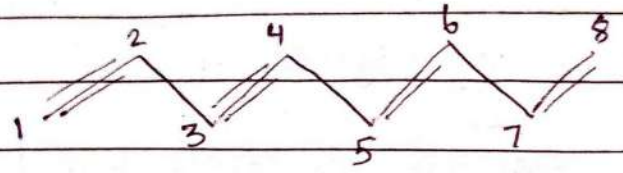
⇒ 4-ethyl 3,7 di-methyl, Octa 1,5,7 tri-yene

4) 

⇒ 5-methyl hexa 2,4 di-yne.

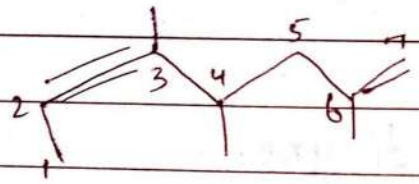
Mix

1)



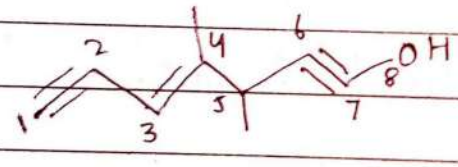
⇒ Octa 1, 3 - di-yne 5, 7 di-ene.

2)



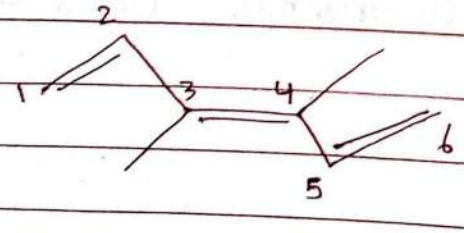
⇒ 2, 3, 4, 6. tetra methyl hepta 2-yne 6-ene.

3)



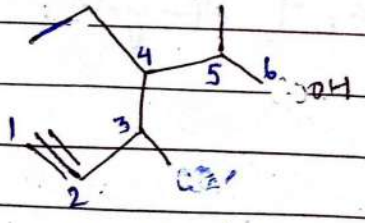
⇒ 4, 5 di-methyl Octa 8-OL 1, 6 - di-yne 3-ene.

4)



⇒ 3, 4 methyl hexa hexa 1, 3, 5 tri-ene.

5)

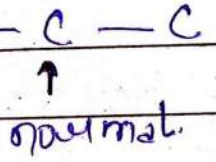


⇒ 4- ethyl 3, 5 dimethyl Hex 1-yne.

Normal structure

When one carbon are structural with another two carbon atom are called Normal structure.

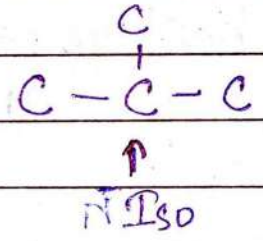
i.e.,



Iso structure

When a carbon are surrounded with another three carbon atom are called Iso structure.

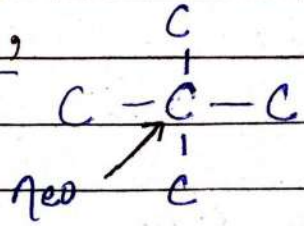
i.e.,



Neo structure

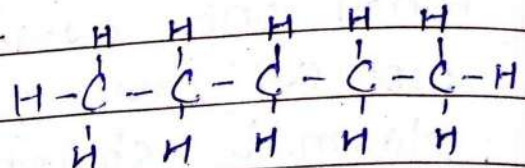
When a carbon are surrounded with another four carbon atom are called neo structure.

i.e.,

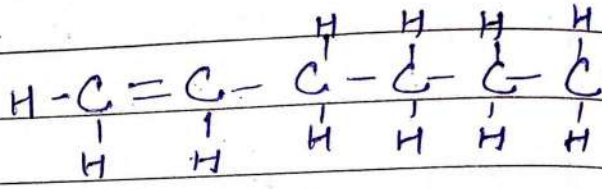


Ques- Write the structure of following cpds.

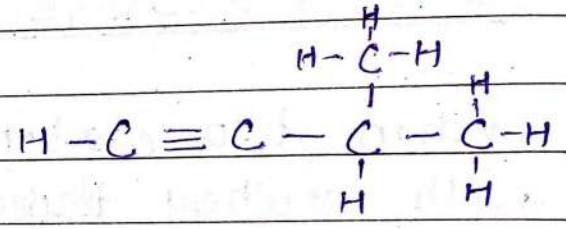
i) Normal pentane :-



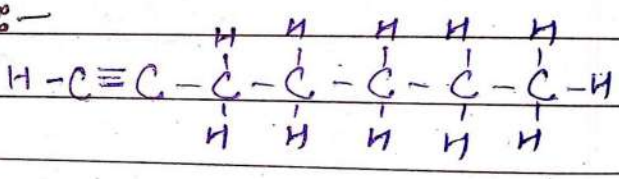
ii) Normal hexene :-



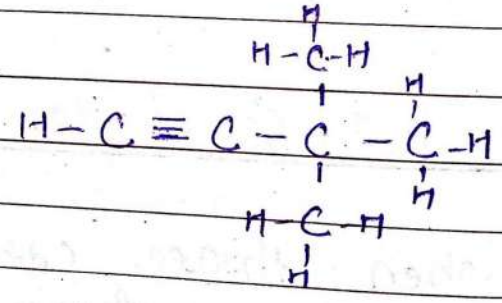
iii) Iso pentyn :-



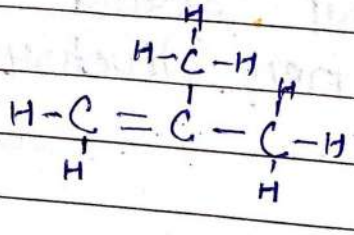
iv) Normal heptyne :-



v) Neo hexyne :-

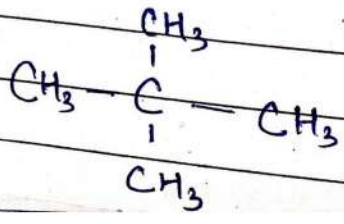


vi) Iso butene :-



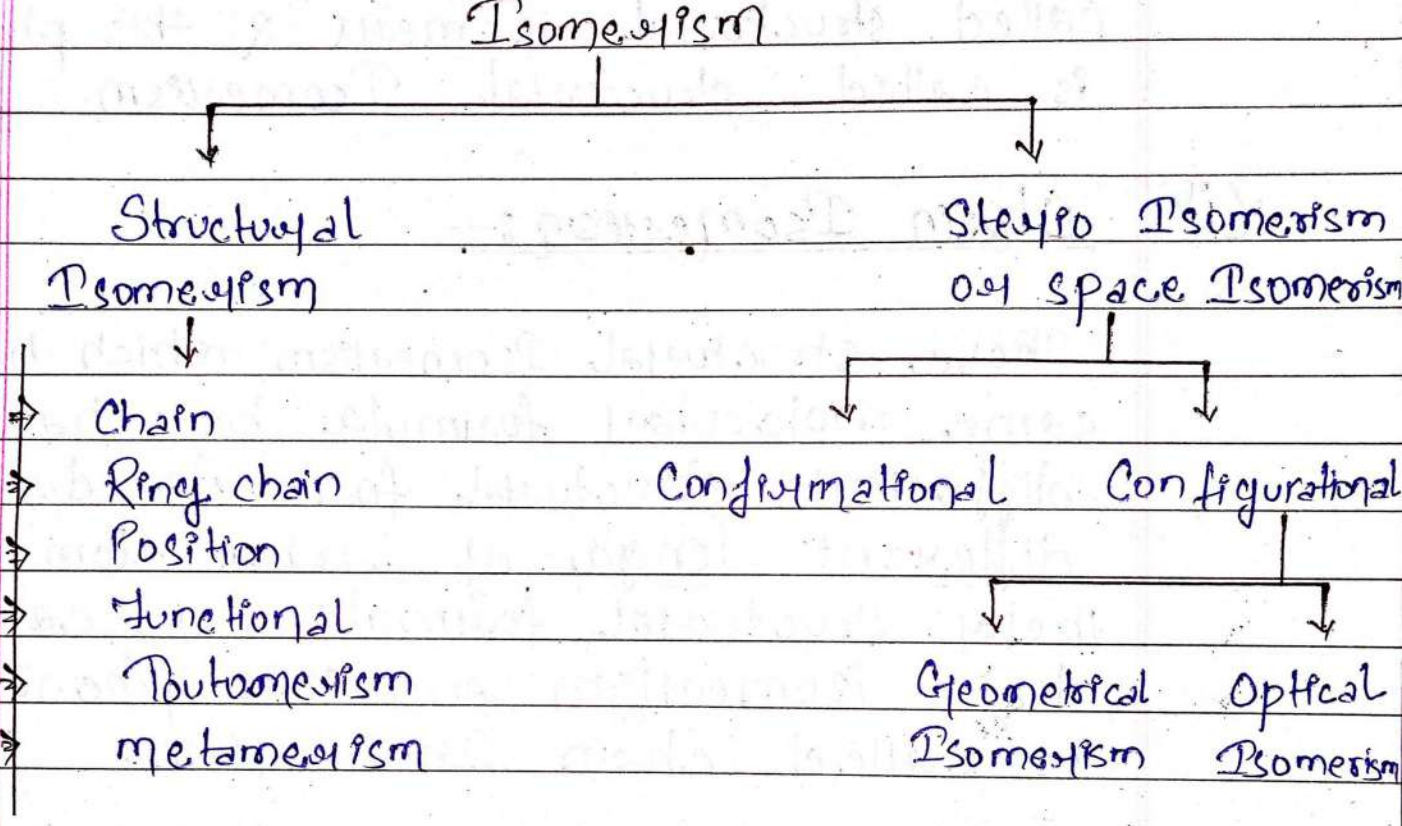
v) Normal Ethyne :-

vi) Neo pentane :-



Volume :- 3

Isomerism :-



The concept of isomerism was given by Berzelius.

* 1st time isomerisms in studies in following :-

(i) NH_4CNO & NH_2CONH_2
(Ammonium cynates) (urea)

(ii) AgOCN & AgCNO

(A) Structural Isomerism :-

Compound having same molecular formula but having different structural, due to different arrangement of atom or group in their structural formula are called structural isomers & this phenomena is called structural Isomerism.

(i) Chain Isomerism :-

These structural Isomerism which have same molecular formula but having different structural formula due to different length of carbon atom chain their structural formula are called chain isomerism and this phenomena is called chain Isomerism.

Alkane

Hexane (C_6H_{14}).

$$CH_3-CH_2-CH_2-CH_2-CH_2-CH_3$$

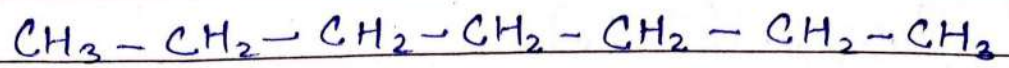
$$\overset{5}{C}H_3-\overset{4}{C}H_2-\overset{3}{C}H_2-\overset{2}{C}H(\overset{CH_3}{\overset{|}{}})-\overset{1}{C}H_3$$

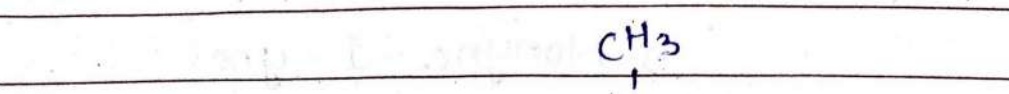
⇒ 2 methyl pentane.

$$CH_3-\overset{CH_3}{\overset{|}{C}}H-\overset{CH_3}{\overset{|}{C}}H-CH_3$$

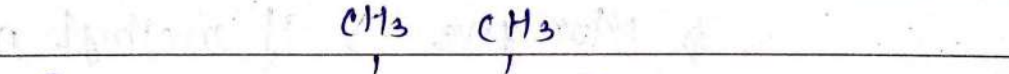
⇒ 2,3 dimethyl butane

Heptane (C_7H_{16})





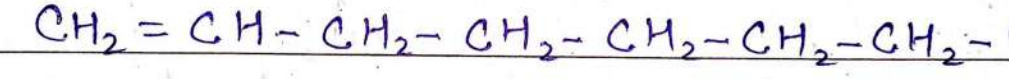
⇒ 2 methyl heptane.

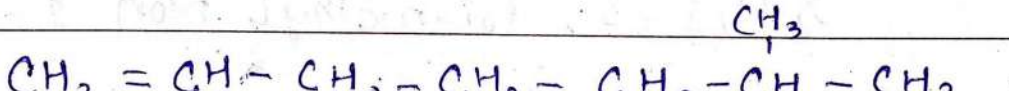


⇒ 2,3 di-methyl heptane.

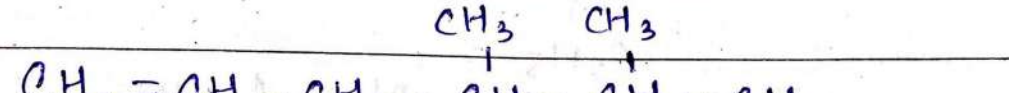
Alkene

Octene

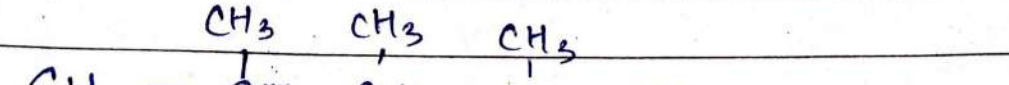




⇒ 6 methyl hept-1-ene.



⇒ 4,5 di-methyl hex-1-ene.



⇒ 2,3,4 tri methyl hex-1-ene.

Alkyne.

Nonyne (C_9H_{16})

$CH \equiv C - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

⇒ Nonyne - 1 - yne.

$CH \equiv C - CH_2 - CH_2 - CH_2 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_3$

⇒ ~~Nonyne~~ ⇒ 7 methyl non - 1-yne.

$CH \equiv C - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - CH_3$

⇒ 4, 5 di-methyl non - 1 -yne.

$CH \equiv C - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - \underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle CH_3}{\overset{|}{C}}}} - CH_3$

⇒ 4, 5, 5, tri-methyl Non 1-yne.

$CH \equiv C - \underset{\displaystyle C_2H_5}{\underset{|}{\overset{\displaystyle C_2H_5}{\overset{|}{C}}}} - C_2H_5$

⇒ 3, 3 di ethyl Non 1-yne.

(iii) **Position Isomerism :-**

Those structural isomers which are same molecular mass but having different structural formula due to different arrangement of position of double bond, triple bond & functional group in their structural isomers are called Position isomerers & their phenomenon is called ~~isom~~ position of isomerism.

Example :-

(i) Octene (C_8H_{16}).

$CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$
⇒ Oct - 1 - ene.

$CH_3 - CH = CH - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$
⇒ Oct - 2 - ene.

$CH_3 - CH_2 - CH = CH - CH_2 - CH_2 - CH_2 - CH_3$
⇒ Oct - 3 - ene.

$CH_3 - CH_2 - CH_2 - CH = CH - CH_2 - CH_2 - CH_3$
⇒ Oct - 4 - ene.

(ii) Octyne (C_8H_{14}).

$CH \equiv C - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$
⇒ Oct - 1 - yne.

$CH_3-C\equiv C-CH_2-CH_2-CH_2-CH_2-CH_3$

⇒ Oct 2-yne.

$CH_3-CH_2-C\equiv C-CH_2-CH_2-CH_2-CH_3$

⇒ Oct 3-yne

$CH_3-CH_2-CH_2-C\equiv C-CH_2-CH_2-CH_3$

⇒ Oct 4-yne.

(iii) $CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-Br$.

$CH_3-CH_2-CH_2-CH_2-CH_2-\underset{\underset{Br}{|}}{CH}-CH_3$

⇒ 2 Bromo heptane.

$CH_3-CH_2-CH_2-CH_2-\underset{\underset{Br}{|}}{CH}-CH_2-CH_3$

⇒ 3 Bromo heptane.

$CH_3-CH_2-CH_2-\underset{\underset{Br}{|}}{CH}-CH_2-CH_2-CH_3$.

⇒ 4 Bromo heptane.

(iv) $CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-OH$

$CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-\underset{\underset{OH}{|}}{CH}-CH_3$

⇒ Octan 2-ol.

$CH_3-CH_2-CH_2-CH_2-CH_2-\underset{\underset{OH}{|}}{CH}-CH_2-CH_3$

⇒ Octan 3-ol.

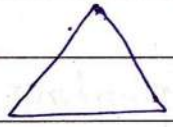
$CH_3 - CH_2 - CH_2 - CH_2 - \underset{OH}{CH} - CH_2 - CH_2 - CH_3$

→ Octan 4-ol.

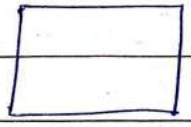
(iii) Ring chain isomerism :-

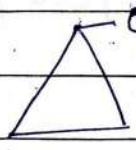
Those structural isomers which have same molecular formula but having different structural formula due to different ring chain are attached to their structural isomers are called ring chain isomers and this phenomenon are called ring chain isomerism.

Example :-

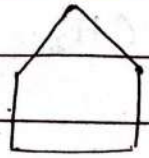
(i) →  C_3H_6
Cyclo propane.

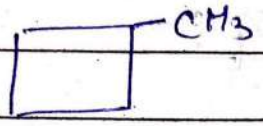
→ $CH_2 = CH - CH_3$

(ii)  C_4H_8
Cyclo butane.

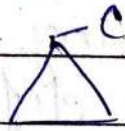
→  1-methyl cyclo propane.

→ $CH_3 = CH - CH_2 - CH_3$

(iii)  C_5H_{10}
cyclo pentane.

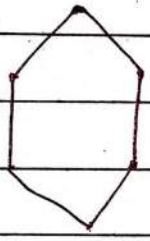
→ 

1- methyl cyclo butane

→ 

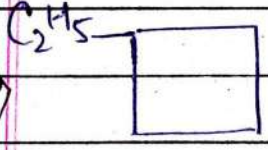
1- ethyl cyclo propane.

→ $CH_2 = CH - CH_2 - CH_2 - CH_3$

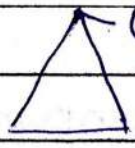
(iv)  C_6H_{12}
cyclo hexane.

→ 

→ 1- methyl cyclo pentane.

→ 

→ 1- ethyl cyclo ~~pentane~~ butane.

→ 

→ 1- propyl cyclo propane.

→ $CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_3$.

(iv) Functional isomerism :-

Compound having same molecular formula but having different structural formula due to different functional group are attached in their structural formula are called functional isomers & this phenomenon are called functional isomerisms.

Examples :-

(i) 'Alcohol' & 'Ether'

⇒ C_2H_5-OH (C_2H_6O) & CH_3-O-CH_3 (C_2H_6O)

C/N ⇒ Ethyl Alcohol
I/N ⇒ Ethanol

C/N ⇒ dimethyl ether
I/N ⇒ methoxy methane

(ii) 'Ketone' & 'Aldehyde'

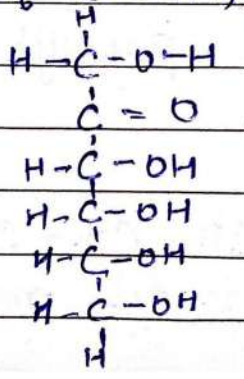
(a) ⇒ $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$ (C_3H_6O) & CH_3CH_2-CHO (C_3H_6O)

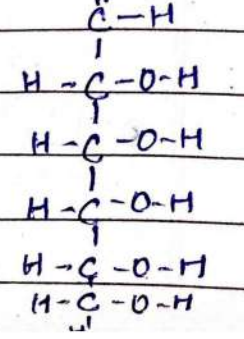
C/N ⇒ di methyl ketone
I/N ⇒ Propanone

C/N ⇒ Propionaldehyde
I/N ⇒ Propanal.

(b) fructose & Glucose.

$C_6H_{12}O_6$ (Ketone) & $C_6H_{12}O_6$ (Ether).





(iii) Acid & Ester

CH_3CH_2COOH $(C_3H_6O_2)$
C/N → Propionic acid
I/N → propanoic acid

$CH_3-\overset{O}{\overset{\|}{C}}-O-CH_3$ $(C_3H_6O_2)$.
C/N → Methyl acetate
I/N → methyl ethanoate

(v) Metamerism :-

Compound having same molecular formula but having different structural formula due to different alkyl group surrounded by same functional group are called metamerism.

Example

- In ether,

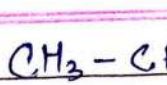
$CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-O-CH_3$
→ Hexyl methyl Ether

$CH_3-CH_2-CH_2-CH_2-CH_2-O-CH_2-CH_3$
→ Ethyl pentyl Ether

$CH_3-CH_2-CH_2-CH_2-O-CH_2-CH_2-CH_3$
→ butyl propyl Ether

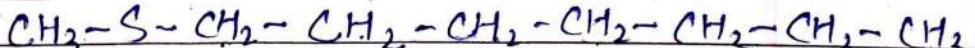
- In Ketone,

$CH_3-CH_2-CH_2-CH_2-\overset{O}{\overset{\|}{C}}-CH_3$
→ Butyl methyl ketone.

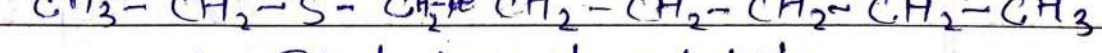


⇒ Ethyl propyl ketone.

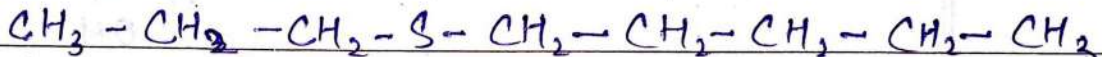
⊙ In sulphide :-



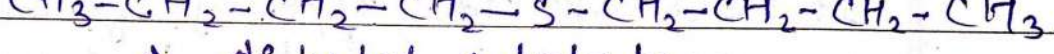
⇒ Heptyl methyl sulphide.



⇒ Ethyl hexyl sulphide.

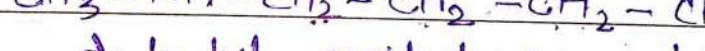


⇒ Pentyl propyl sulphide

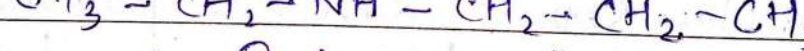


⇒ di butyl sulphide.

⊙ In Amine :—



⇒ butyl methyl secondary amine.



⇒ Ethyl propyl secondary amine.

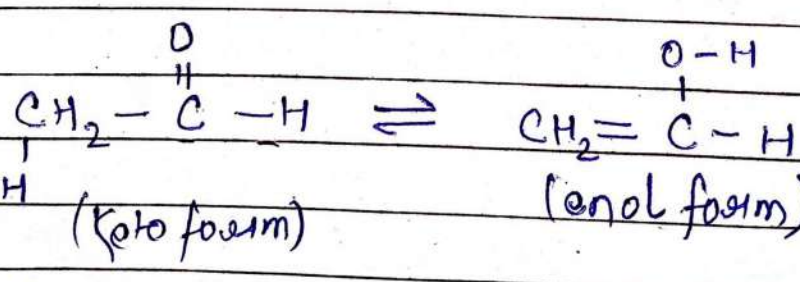
(vi) Tautomerism :-

Also known as :- Keto-enol Isomerism
or
Pseudo Isomerism
or
Desmotropism
or
Kenyptomerism
or
Allelotropism.

It is a special type of functional isomerism in which two functional group are exist in dynamic Equilibrium at room temp.

There are two condition to display the tautomerism :-

(i) molecules should have π-p bond.
(ii) molecules should have α-hydrogen atom.



(Keto form) ⇌ (enol form).

→ Ethanone → Eth-1-ene-2-ol.

(B) Stereo Isomerism :-

Also known as :- space Isomerism.

Stereo or space chemistry :-

The branch of chemistry in which we study about molecular structure in three dimensional space is called stereo chemistry.

⇒ Those isomers which have same molecular formula & same structural formula but into different arrangemet of atom or group in space are called space Isomers and this phenomenon is called space Isomerism.

There are two form of space Isomerism :-

(i) Configurational Isomerism
(ii) Confirmational Isomerism.

(i) Configurational Isomerism :-

Those space Isomerism which are not interconvertable to each other without breaking of bond are called configurational Isomers and this phenomenon is called configurational Isomerism.

There are two types of configurational isomerism :-

(1) Geometrical Isomerism
(2) Optical Isomerism.

(1) Geometrical Isomerism :-

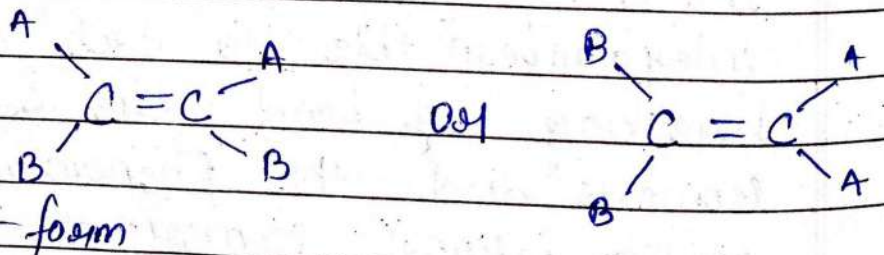
Those configurational Isomerism which have same molecular formula & same structural formula but having different arrangement of atom or group around the doubly-double bonded carbon atom are called Geometrical Isomers & this phenomenon is called Geometrical Isomerism.

There are two forms of Geometrical Isomerism
(i) Cis - form
(ii) Trans - form

(i) Cis - form :-

When two similar atom or group are present in a same side of double bonded carbon atom, then this given geometrical isomerism are called Cis-form.

Ex :-

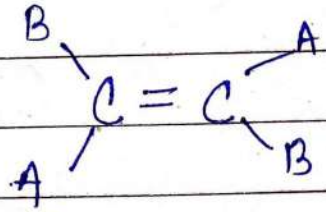


Cis-form

(iii) Byans-form :-

when two similay atom ay group are present in a opposite side of double bonded carbon atom, then this geometrical Isomerism is called Byans-form.

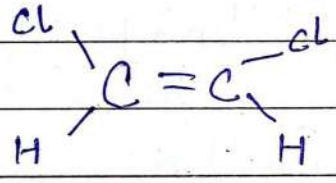
Ex:-



Byans- form.

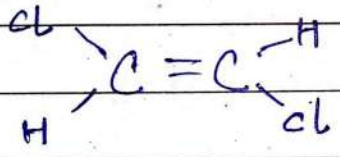
Some important example of geometrical isomerism :-

(i)



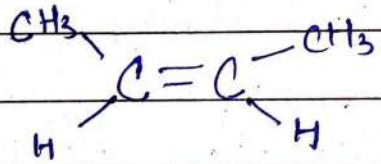
Cis-1, 2 di-chloyo eth-1-ene.

(ii)



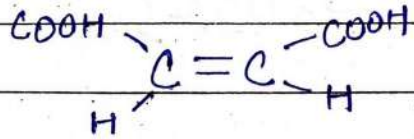
Byans-1, 2 di-chloyo eth-1-ene.

(iii)



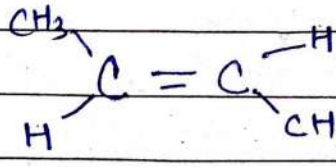
Cis but-2-ene.

(iv)



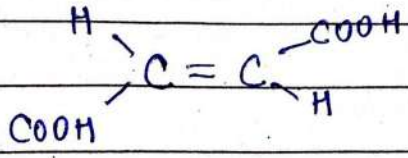
Cis but 2-ene 1, 4 di-oic aicd.

(v)



Byans but 2-ene.

(vi)



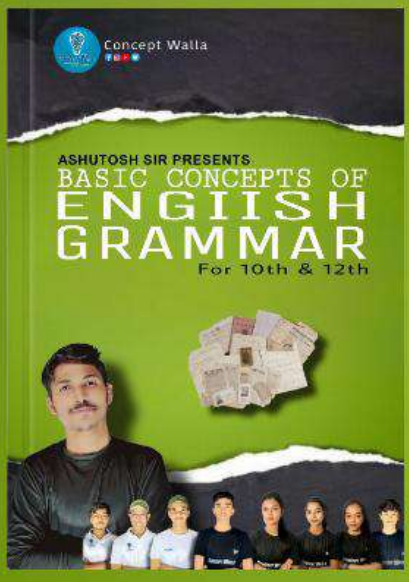
trans but 2-ene, 1, 4 di-oic acid.

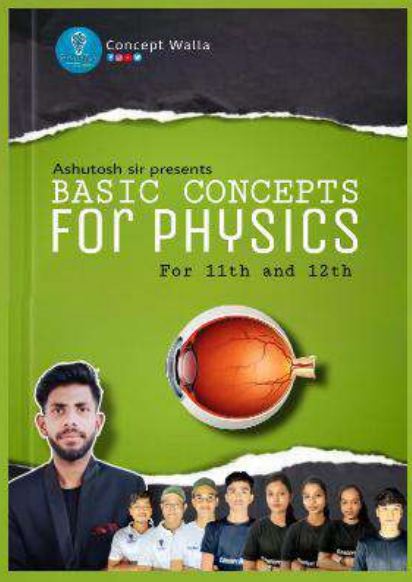
BASIC ORGANIC CHEMISTRY

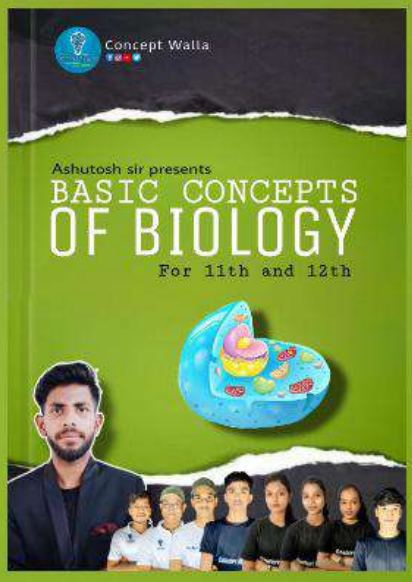
GRADE 10th 12th

IN THIS BOOK

- HANDWRITTEN NOTES
- AMAZING CONCEPTS
- EASY TO LEARN







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