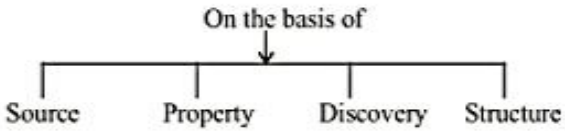
NOMENCLATURE OF ORGANIC COMPOUNDS

Mainly three systems are adopted for naming an organic compound : –

(i) **Common Names or Trivial System**
(ii) **Derived System**
(iii) **IUPAC system or Geneva System**

COMMON OR TRIVIAL SYSTEM



(i) On the basis of source from which they were obtained.

S.No.	Organic Compound	Trivial Name	Source
1.	CH_3OH	Wood spirit or Methyl spirit	Obtained by destructive distillation of wood.
2.	NH_2CONH_2	Urea	Obtained from urine
3.	CH_4	Marsh gas (fire damp)	It was produced in marsh places.
4.	CH_3COOH	Vinegar	Obtained from Acetum - i.e. Vinegar
5.	$\begin{matrix}COOH\\\vert\\COOH\end{matrix}$	Oxalic acid	Obtained from oxalis plant.
6.	$HCOOH$	Formic acid	Obtained from formicus [Red ant]
7.	$CH_3-\underset{\vert}{\overset{OH}{CH}}-COOH$	Lactic acid	Obtained from lactous (milk)
8.	$\begin{matrix}CH_2-COOH\\\vert\\CH(OH)COOH\end{matrix}$	Malic acid	Obtain from Apple
9	$CH_3CH_2CH_2COOH$	Butyric acid	Obtained from butter.
10.	$CH_3(CH_2)_4COOH$	Caproic acid	Obtained from goats.
11.	C_2H_5OH	Grain alcohol	Obtained from barley.

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(ii) On the basis of property

1. Glucose - Sweet in test
2. Glycol - Sweet poisnous
3. Glycerol - Sweet
   (Glycus - Sweet)

(iii) On the basis of discovery

1. RMgx (Grigard Reagent)
2. R_2Zn (Frankland reagent)

(iv) On the basis of structure

S.No.	No. of Carbon atom	Word Root
(i)	1C	Meth
(ii)	2C	Eth
(iii)	3C	Prop
(iv)	4C	But
(v)	5C	Pent
(vi)	6C	Hex
(vii)	7C	Hept
(viii)	8C	Oct
(ix)	9C	Non
(x)	10C	Dec

Common Names for Hydrocarbon Derivatives

S.No.	Compound	Name
1.	R – X	Alkyl halide
2.	R – OH	Alkyl alcohol
3.	R – SH	Alkyl thio alcohol
4.	R – NH_2	Alkyl amine
5.	R–O–R	Dialkyl ether
6.		Dialkyl ketone
7.	R–NH–R	Dialkyl amine
8.		Trialkyl amine
9.	R–O–R'	Alkyl alkyl' ether
10.		Alkyl alkyl' ketone
11.	R–NH–R'	Alkyl alkyl' amine
12.		Alkyl alkyl' alkyl" amine

R is termed as alkyl -

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GROUPS

Atom or a group of atoms which possess any 'free valency' are called as **Groups**.

If their are two structure of same molecular formula then some prefix (n, iso, neo) are used two differentiate them.

Normal group : –

(a) It is represented by 'n'.

(b) Groups having no branch (Straight chain).

(c) Free bond will come either on Ist carbon atom or on last carbon atom.

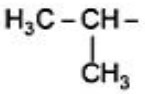
n – butyl $CH_3 - CH_2 - CH_2 - CH_2 -$

n – propyl $CH_3 - CH_2 - CH_2 -$

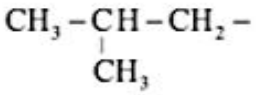
Iso group : –

When one methyl group is attached to the second last carbon of the straight carbon chain is named as iso group.

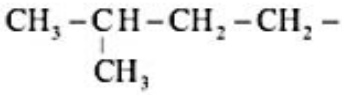
e.g.



Isopropyl

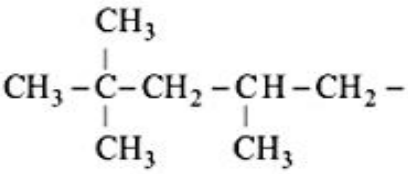


Isobutyl

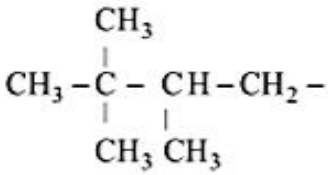


Isopentyl

Exception :



(i) Iso octyl

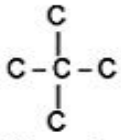


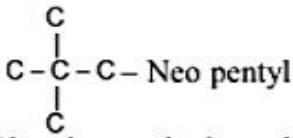
(ii) Iso heptyl

Neo group : –

(a) When two methyl groups on second last carbon of a straight carbon chain is attached to other four carbon atom group is named as neo group.

(b) It is represented by following structure -

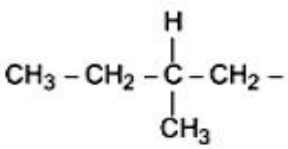


for eg. 

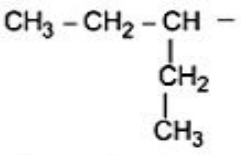
(c) There should be one 4° carbon and atleast three methyl group on 4° carbon.

NOTE : (Optically Active) = If all valency are attached to different atoms.

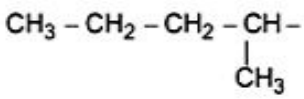
Amyl group : –



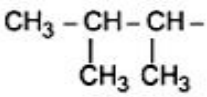
Active amyl



Secondary amyl



Active secondary amyl



Active iso secondary amyl

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Secondary group : –

(a) The carbon having free valency attached to two carbon is called secondary carbon.

(b) It is represented by following structure. $C-\underset{|}{C}-C-C$

eg. (i) $CH_3-\underset{|}{CH}-CH_2-CH_3$ (ii) $CH_3-\underset{|}{CH}-CH_2-CH_2-CH_3$

(secondary butyl) (secondary pentyl)

Tertiary group : –

(a) The carbon having free valency attached to three other carbon .

(b) It is represented by following structure - $\begin{array}{c} C \\ | \\ C-\underset{|}{C}-C \end{array}$

e.g. (i) $\begin{array}{l} CH_3 \\ | \\ CH_3-\underset{|}{C}-CH_3 \end{array}$ $\begin{array}{l} CH_3 \\ | \\ CH_3-\underset{|}{C}-CH_2-CH_3 \end{array}$

(Tertiary butyl) (Tertiary pentyl)

Alkyl group : –

When a hydrogen is removed from Alkane (saturated hydrocarbon) then alkyl group is formed.

A bond is vacant on alkyl group on which any functional group may come.

alkane $\xrightarrow[-H]{}$ **Alkyl -**

(C_nH_{2n+2}) (C_nH_{2n+1})

e.g.

(i) $CH_4 \xrightarrow[-H]{} CH_3-$

Methane Methyl

(ii) $CH_3-CH_3 \xrightarrow[-H]{} CH_3-CH_2-$

Ethane ethyl

(iii) $CH_3-CH_2-CH_3 \xrightarrow{-H}$ Propane

- $CH_3-CH_2-CH_2-$ n-Propyl
- $CH_3-\underset{|}{CH}-CH_3$ iso-Propyl

(iv) $CH_3-CH_2-CH_2-CH_3 \xrightarrow{-H}$ n-Butane

- $CH_3-CH_2-CH_2-CH_2-$ n-Butyl
- $CH_3-\underset{|}{CH}-CH_2-CH_3$ Sec. Butyl

(v) $\begin{array}{l} CH_3-\underset{|}{CH}-CH_3 \\ | \\ CH_3 \end{array} \xrightarrow{-H}$ iso-butane

- $\begin{array}{l} CH_3-\underset{|}{CH}-CH_2- \\ | \\ CH_3 \end{array}$ iso-butyl
- $\begin{array}{l} CH_3-\underset{|}{C}-CH_3 \\ | \\ CH_3 \end{array}$ tertiary-butyl

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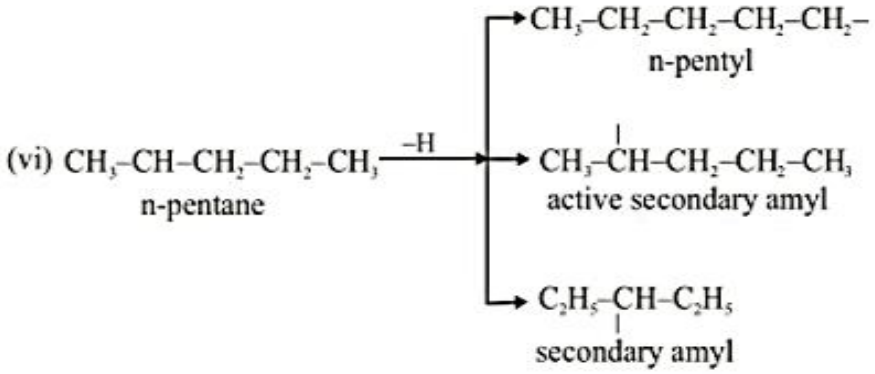

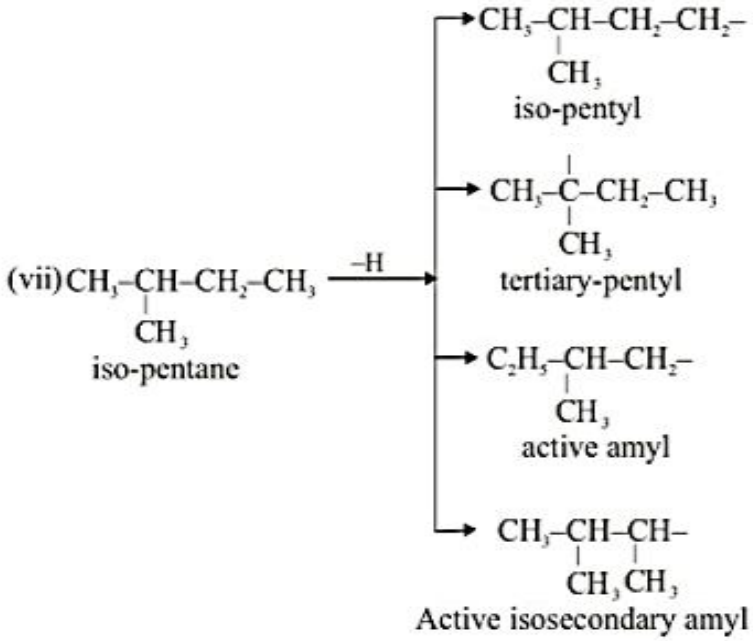

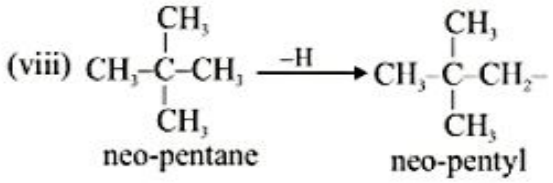

Alkenyl group : –

alkene $\xrightarrow{-H}$ **Alkenyl -**

(C_nH_{2n}) **(C_nH_{2n-1})**

$CH_2 = CH -$ Vinyl

$CH_2 = CH - CH_2 -$ Allyl

$CH_3 - CH = CH -$ Propenyl(1-propenyl)

$CH_3 - C(CH_3) = CH_2$

Isopropenyl (1-methyl-1-ethenyl)

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Alkynyl group –

$$\text{alkyne} \xrightarrow[-H]{} \text{Alkynyl -}$$

(C_nH_{2n-2}) (C_nH_{2n-3})

$CH \equiv C -$	$CH \equiv C - CH_2-$	$CH_3 - C \equiv C -$
Ethynyl	Propargyl (2-propynyl)	Propynyl (1-propynyl)

Alkylidene group –

$$\text{alkane} \xrightarrow[\text{from same carbon}]{-2H} \text{Alkylidene -}$$

Alkylene group

$$\text{alkane} \xrightarrow[\text{from different carbon}]{-2H} \text{Alkylene -}$$

Position of double bond : –

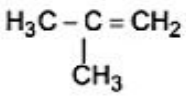
In an unsaturated hydrocarbon if the position of double bond is on Ist or last carbon then it's prefix will be α (alpha) if it is on 2nd carbon it is termed as β (Beta) & the γ (gamma) & δ (delta) and so on.

eg. $H_2C = CH - CH_2 - CH_3$ α - butylene

$H_3C - CH = CH - CH_3$ β - butylene

$H_3C - CH_2 - CH = CH_2$ α - butylene

$H_2C = CH - CH_3$ or $H_3C - CH = CH_2$ (Both are same positions, propylene)



Isobutylene

$CH_3-CH_2-CH=CH-CH_2-CH_3$ γ - hexylene

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

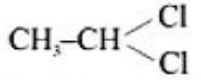
δ - octylene

COMMON - NAMING OF DIHALIDES

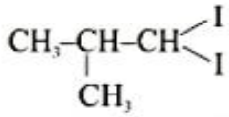
(a) When two same halogen atoms are attached to the same carbon such compounds are called **Gemdihalides**.

(b) Common names of such compounds are alkylidene halides

eg. :

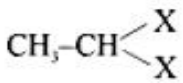


Ethylidene chloride



Isobutylidene Iodide

Exception : Methylidene halide (wrong)



Methylene halide (right)

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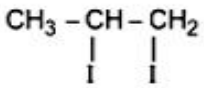
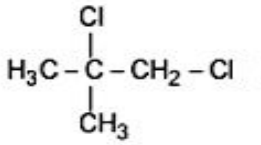
(c) When two same halogen atoms are attached to adjacent carbon, these are called as vicinal dihalides. Common names of such compounds are alkylene halide.

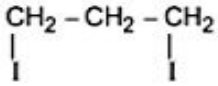
eg  Propylene Iodide

 Isobutylene chloride

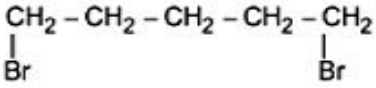
(d) When two same halogen atoms are attached at the two ends of a carbon chain its common naming will be polymethylene halide.

'poly' word indicates the number of $-CH_2-$ groups.

$-CH_2-$	2	3	4	5	6
Poly	di	tri	tetra	penta	Hexa

eg. 

Trimethylene Iodide



Pentamethylene Bromide

Exception : –

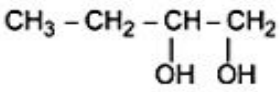
$CH_2 - X$ dimethylene halide (wrong)

|

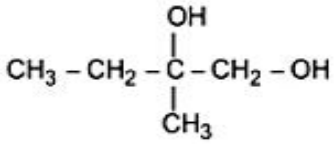
$CH_2 - X$ ethylene halide (right)

COMMON - NAMING OF DI-HYDROXY COMPOUNDS

(a) When two –OH groups are attached to adjacent carbon atoms they are termed as alkylene glycol.



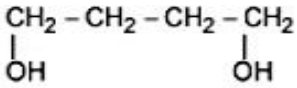
Butylene glycol



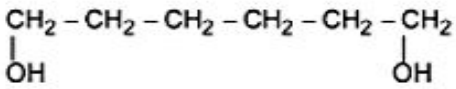
Active amylene glycol

(b) When two –OH group are attached at the two ends of a carbon chain, these compounds are named as polymethylene glycol.

Poly → Number of CH_2 groups.

eg. : 

Tetra methylene glycol



Hexamethylene glycol

Exception :

$CH_2 - OH$ Dimethylene glycol (wrong)

|

$CH_2 - OH$ Ethylene glycol (right)

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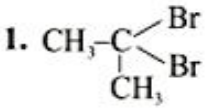
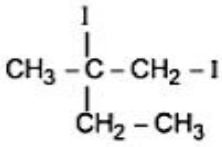
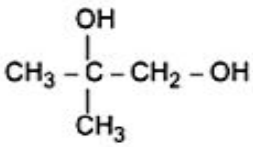
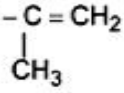
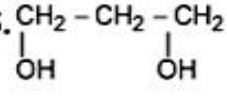
PROBLEMS

Make the structure of following organic compounds -

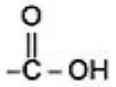
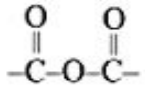
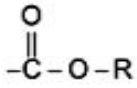
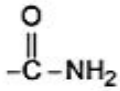
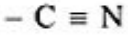
1. Isopropylidene Bromide
2. Active amylene Iodide
3. Isobutylene glycol
4. Isobutylene
5. Trimethylene glycol

ANSWERS

1. 
2. 
3. 
4. 
5. 

COMMON-NAMING OF THE FUNCTIONAL GROUP HAVING CARBON

(Common naming for Hydrocarbon derivatives)

S.No.	Functional group	Suffix
(i)		-ic Acid
(ii)		-ic anhydride
(iii)		-ate
(iv)		-amide
(v)		-yl halide
(vi)		-aldehyde
(vii)		-o-nitrile
(viii)		-o-isonitrile

Prefix : –

1 Carbon → Form-

2 Carbon → Acet-

3 Carbon → Propion-

4 Carbon → Butyr- (→ Normal, → Iso)

5 Carbon →

Valer- (→ Normal-, → Iso, → Secondary-, → Tertiary-)

3 C + (=) double bond = Acryl-

4 C + double bond = Croton-

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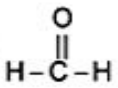
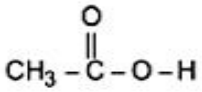
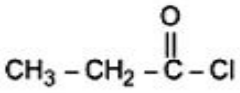
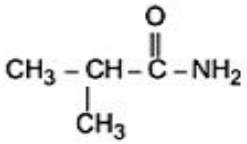
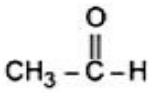
eg.  Formaldehyde

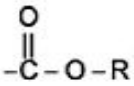
 Acetic Acid

 Propionyl chloride

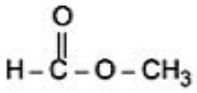
 Isobutyramide

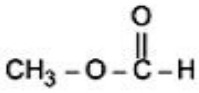
 Acetaldehyde

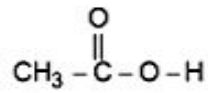
NOMENCLATURE OF ESTER

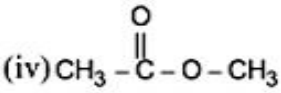


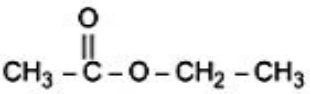
The group which is attached to the oxygen is written as alkyl & the remaining structure is named on the basis of Functional Group suffix.

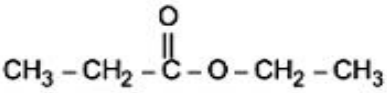
eg. (i)  Methyl formate

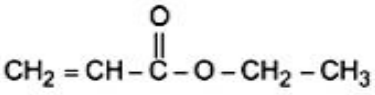
(ii)  Methyl formate

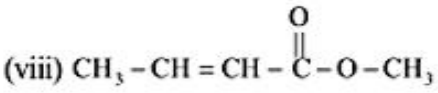
(iii)  Acetic acid

(iv)  Methyl acetate

(v)  Ethyl acetate

(vi)  Ethyl propionate

(vii)  Ethyl acrylate

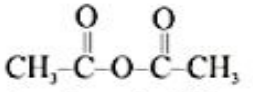
(viii)  Methyl crotonate

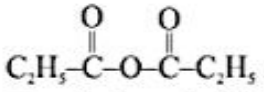
NOMENCLATURE OF ANHYDRIDE

Rule : – Add the total number of carbon atoms & divide it by 2, the substract will give you the number of C - atom. Now name it according to suffix use for anhydride.

$\frac{\text{Total}}{2}$ = Substract

= Number of C atom

$\frac{4}{2} = 2$  Acetic anhydride

$\frac{6}{2} = 3$  Propionic anhydride

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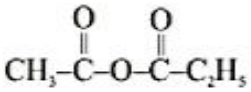
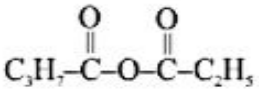
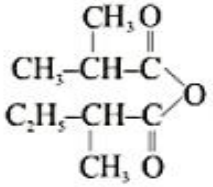
If R ≠ R', You need not to find out substract.

eg. 

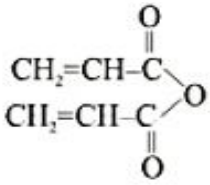
Acetic propionic anhydride (right)
Propionic Acetic anhydride (wrong)
Divide it in two parts as above & name it by suffixing ic anhydride (alphabatically)

eg. 

Butyric propionic anhydride



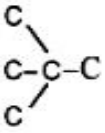
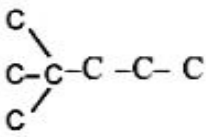
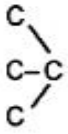
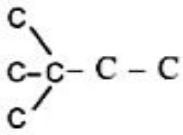
Isobutyric Secondary valeric anhydride



Acrylic anhydride

SOLVED EXAMPLE

Q.1 Which of the following is not a neo structure:–

(A)  (B)  (C)  (D) 

Ans. C

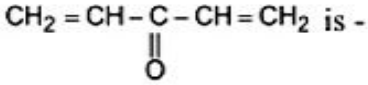
Sol. A carbon must be attached with four carbons.

Q.2 Acryl aldehyde is -

(A) A saturated aldehyde (B) An alkene
(C) A polymer (D) An unsaturated aldehyde

Ans. D

Sol. $CH_2 = CH - CHO$ unsaturated aldehyde.

Q.3 The common name of the compound  is -

(A) Divinyl ketone (B) Diallyl ketone (C) Both A and B (D) None

Ans. A

Sol. $CH_2 = CH -$ is called as vinyl group.

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Q.4 Common name of CH_2=CH–CN is :

(a) acrylonitrile (b) vinyl cyanide (c) allyl cyanide (d) allyl nitrile

(A) a, b and d (B) a, and b (C) only b (D) a, b and c

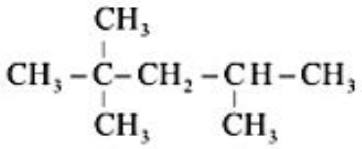
Ans. **B**

Q.5 The number of possible alkyl groups of iso octane are -

(A) 1 (B) 3 (C) 5 (D) 6

Ans. **B**

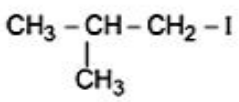
Sol.

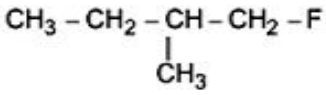


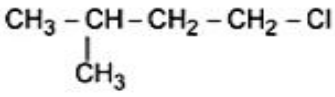
1 + 1 + 1 = 3

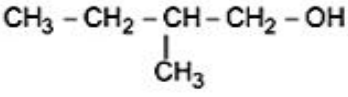
Q.6 Write the common names of the following compounds

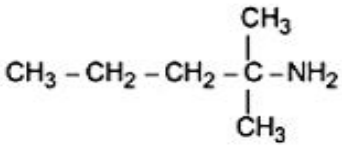
1. $CH_3 - CH_2 - CN$

2. 

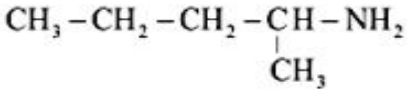
3. 

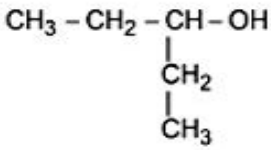
4. 

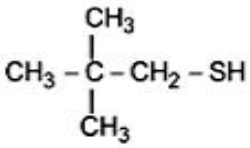
5. 

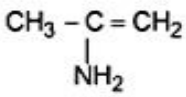
6. 

7. $CH_2 = CH - SH$

8. 

9. 

10. 

11. 

12. $CH \equiv C - CH_2 - Br$

ANSWERS

1. Ethyl cyanide
2. Isobutyl Iodide
3. Active amyl fluoride
4. Iso pentyl chloride
5. Active amyl alcohol
6. Tertiary hexyl amine
7. Vinyl thio alcohol
8. Active secondary amyl amine
9. Secondary amyl alcohol.
10. Neopentyl thio alcohol
11. Isopropenyl amine
12. Propargyl Bromide

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MCQ

Q.1 Which of the following are secondary radicals :

(a) $CH_3-\dot{C}H-C_2H_5$ (b) $CH_2=\dot{C}-CH_3$ (c) CH_2=CH– (d) $(CH_3)_2$CH–

(A) a, b, c, (B) a, d, c (C) b, c, d (D) a, b, d

Q.2 Common name of the structure $\begin{matrix} CH_2-OH \\ | \\ CH_2-OH \end{matrix}$

(A) Ethylene Glycol (B) Ethene dialcohol (C) Glycerol (D) Ethylene alcohol

Q.3 Common name of the compound $CH_3-CH_2-\overset{O}{\overset{\|}{C}}-NH_2$ is -

(A) Acetamide (B) Propionamide (C) Butyramide (D) Acetic amide

Q.4 The structure of 2–butenyl radical is :

(A) $CH_3-\dot{C}H-C_2H_5$ (B) CH_3–CH=CH–CH_2–

(C) $CH_3-CH_2-\underset{|}{C}-CH_3$ (D) $CH_2=CH_2-\underset{|}{C}-CH_3$

Q.5 Which one is structure of Maleic acid

(A) $\begin{matrix} & & O \\ & & \| \\ H-C & = & C-OH \\ \| & & \\ HO-C & - & C-H \\ \| & & \\ O & & \end{matrix}$ (B) $\begin{matrix} HO-CH-COOH \\ | \\ CH_2-COOH \end{matrix}$

(C) $\begin{matrix} HO-CH-COOH \\ | \\ HO-CH-COOH \end{matrix}$ (D) $\begin{matrix} & & O \\ & & \| \\ H-C & = & C-OH \\ \| & & \\ H-C & - & C-OH \\ & & \| \\ & & O \end{matrix}$

Q.6 Common name of the structure $CH_3-\underset{\|}{\overset{O}{C}}-O-CH=CH_2$ is :

(A) vinyl acetate (B) acryle acetate (C) methyl acrylate (D) Vinyl ethanoate

Q.7 Which is the structural formula of isoprene

(A) $\begin{matrix} CH_3-C=CH_2 \\ | \\ CH_3 \end{matrix}$ (B) $\begin{matrix} & CH_3 \\ & | \\ CH_2=C-CH=CH_2 \end{matrix}$

(C) $\begin{matrix} & Cl \\ & | \\ CH_2=C-CH=CH_2 \end{matrix}$ (D) CH_3–CH=CH–CH_3

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Q.8 The number of gem dihalides possible with the molecular formula $C_2H_4X_2$ and $C_3H_6X_2$ is given by the set :

(A) 1, 2 (B) 2, 1 (C) 2, 2 (D) 1, 1

Q.9 Common name of the compound C_6H_5CHO

(A) Anisole (B) Benzaldehyde (C) Salicylaldehyde (D) None of these

ANSWERS

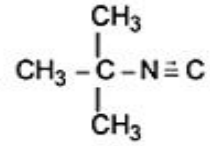
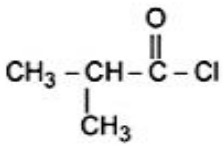
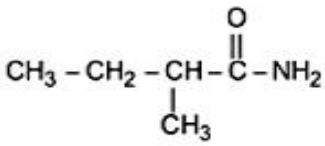
Q.1(D) Q.2(A) Q.3(B) Q.4(B) Q.5(D) Q.6(A) Q.7(B) Q.8(A) Q.9(B)

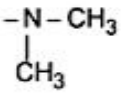
PROBLEMS

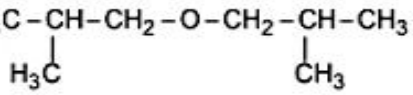
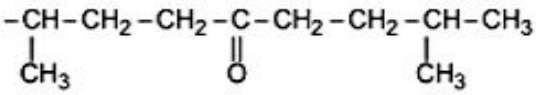
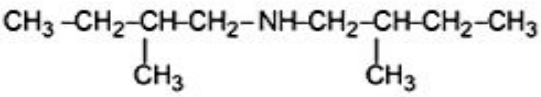
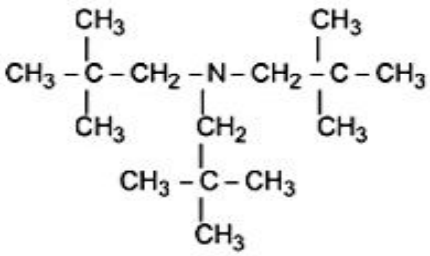
Q.1 Write down the structures of the following -

1. Di allyl amine
2. Tri methyl amine
3. Di isobutyl ether
4. Di isopentyl ketone
5. Di Active amyl amine
6. Di normal propyl ether
7. Tri neopentyl amine

Q.2 Write down the common names of the following :

1. 
2. 
3. 

Ans.(1) 1. $CH_2=CH-CH_2-NH-CH_2-CH=CH_2$ 2. 

3. 
4. 
5. 
6. $CH_3-CH_2-CH_2-O-CH_2-CH_2-CH_3$
7. 

Ans. (2) 1. Tertiary valero-isonitrile 2. Isobutyryl chloride 3. Secondary Valer amide

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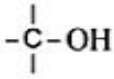
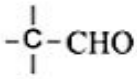
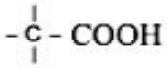
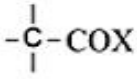
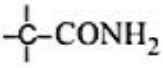
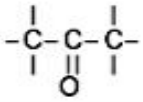
DERIVED SYSTEM

According to this system name to any compound is given according to the parent name of the homologous series. This system is reserved for the following nine homologous series.

S.No.	Name of Homologous series	Derived Name	Structure of group
1.	Alkane	Methane	
2.	Alkene	Ethylene	>C=C<
3.	Alkyne	Acetylene	–C≡C–
4.	Alkanol	Carbinol	
5.	Alkanal	Acetaldehyde	
6.	Alkanoic acid	Acetic acid	
7.	Alkanoyl halide	Acetyl halide	
8.	Alkanamide	Acetamide	
9.	Alkanone	Acetone	

Types of Ethylene:– (Symmetrical & Unsymmetrical)

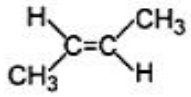
(a) **Symmetrical :** –In the given two alkyl groups one group is attached to the one carbon of ethylene & next on the next carbon.

(b) **Unsymmetrical :** – When both the given groups are attached on the same carbon.

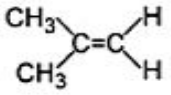
Note : Symmetrical & Unsymmetrical : –Terms are used only when two alkyl groups are given.

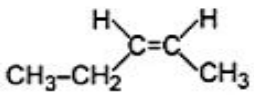
eg.

Symmetrical dimethyl ethylene

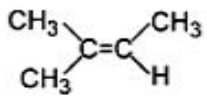


Unsymmetrical dimethyl ethylene

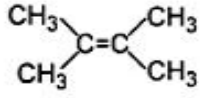




Symmetrical ethyl methyl ethylene



Tri methyl ethylene



Tetra methyl ethylene

$CH_3-C\equiv C-CH_3$

Dimethyl acetylene

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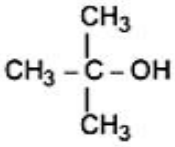
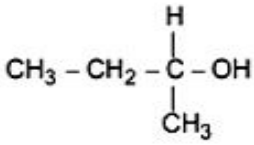
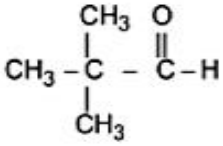
PROBLEMS

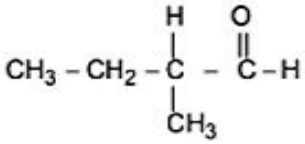
Write down the derived names of the following compounds

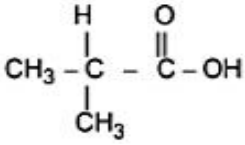
1. $CH_2 = CH - CH_2 - C \equiv C - H$

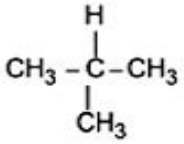
2. 

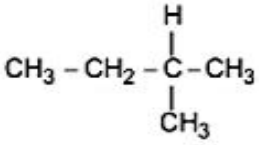
3. 

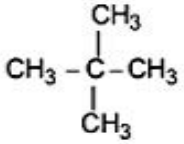
4. 

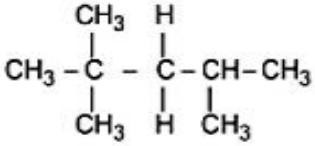
5. 

6. 

7. 

8. 

9. 

10. 

ANSWERS

1. Allyl acetylene
2. Tri methyl carbinol
3. Ethyl methyl carbinol
4. Tri methyl acetaldehyde
5. Ethyl methyl acetaldehyde
6. Di methyl acetic acid
7. Tri methyl methane
8. Ethyl di methyl methane
9. Tetra methyl methane
10. Tertiary butyl Isopropyl methane.

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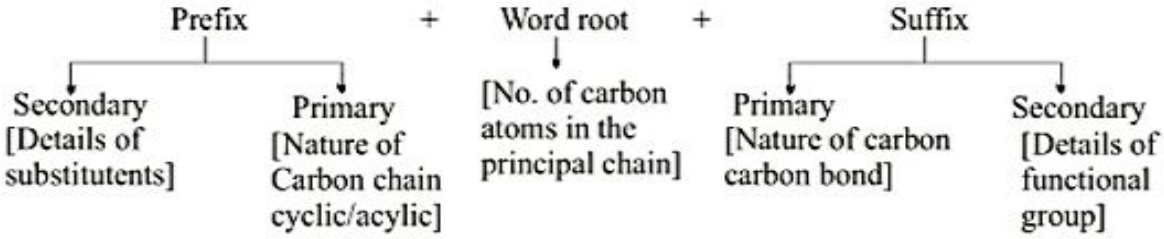
IUPAC NOMENCLATURE

The name consists of three parts:



Primary Prefix : It represents the nature of the principal / parent chain.

Nature of chain	Primary Prefix
Acyclic / Non-cyclic	–
Cyclic	Cyclo
Bicyclic	Bicyclo
Tricyclic	Tricyclo
Spiro	Spiro

Secondary prefix : It represent substituents.

Word root : It represents the number of carbon atoms in the principal / parent chain.

No. of carbon atoms	Word root
1	Meth
2	Eth
3	Prop
4	But
5	Pent
6	Hex
7	Hept
8	Oct
9	Non
10	Dec
11	Undec
12	Dodec
13	Tridec
20	Eicos
30	Triacont
40	Tetracont

Primary Suffix : It represents the nature of C–C bonds in the principal/ parent chain (whether single bond, double bond or triple bond).

Nature of bond	Primary suffix
Saturated C–C single bond	ane

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Nature of bond	Primary suffix
Unsaturated	
C = C bond	ene
C ≡ C bond	yne
2C = C bonds	diene
2C ≡ C bonds	diyne
C = C + C ≡ C	ene + yne = enyne

* If secondary suffix starts from a vowel or y then the last 'e' of first suffix is omitted.

Secondary suffix : is used for functional groups.

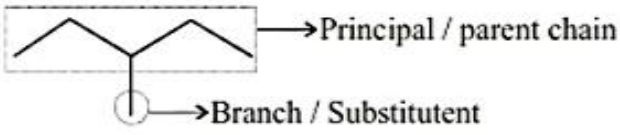
SATURATED UNBRANCHED HYDROCARBONS

IUPAC name = Word Root + Primary Suffix

e.g.

CH_4	Meth + ane	=	Methane
$CH_3 - CH_3$	Eth + ane	=	Ethane
$CH_3–CH_2–CH_3$	Prop + ane	=	Propane
	But + ane	=	Butane
	Pent + ane	=	Pentane
	Hex + ane	=	Hexane
$CH_3(CH_2)_9CH_3$	Undec + ane	=	Undecane
$CH_3(CH_2)_{28}CH_3$	Triacont + ane	=	Triacontane

SATURATED BRANCHED CHAIN HYDROCARBONS



Rules for naming Branches

$R - H \xrightarrow{-H} R-$

Alkane	Alkyl substituent
(C_nH_{2n+2})	(C_nH_{2n+1})

e.g.

	Alkane	Alkyl	IUPAC names
(1)	CH_4	$–CH_3$	Methyl
(2)	C_2H_6	$–C_2H_5$	Ethyl

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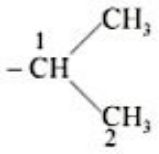
Naming of complex alkyl groups

(i) Longest chain in a branch is selected starting from the same and where it originates from.

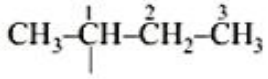
(ii) Numbering is started from the originating end of a branch.

(3) C_3H_8 $-CH_2CH_2CH_3$ Propyl

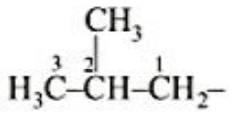


1– Methyl ethyl

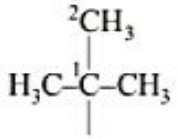
(4) C_4H_{10} $-C_4H_9$ $\overset{4}{C}H_3\overset{3}{C}H_2\overset{2}{C}H_2\overset{1}{C}H_2-$ Butyl



1-methyl propyl

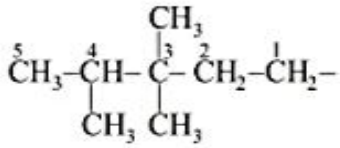


2-methyl propyl



1,1-dimethylpropyl

(5)

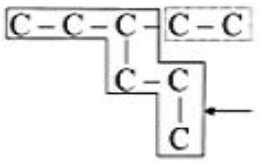


3,3,4-trimethyl-pentyl

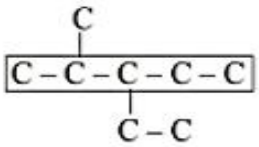
SATURATED BRANCHED CHAIN HYDROCARBONS

Rules

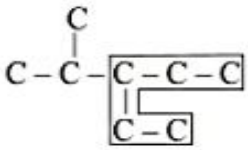
(1) **Longest chain rule** : Select the longest possible carbon chain as the parent chain or principal carbon chain. All other carbon chains will be considered as side chain or substituents.



(2) If there is more than one longest chain possible then select the chain which contains maximum number of side chains



Correct



Incorrect

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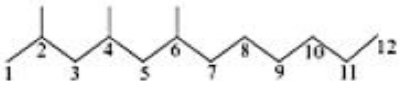
(3) **Lowest set of locant rule** : The number given to the side chain is locant. While numbering the parent chain, lowest set of locants rule needs to be followed. According to this rule, that set of locants will be considered which has got a lower number at the first point of difference.

I = (2, 2, 3, 6, 8) ← Correct

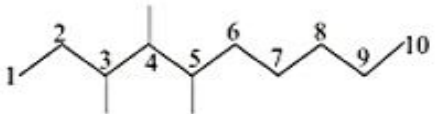
II = (2, 2, 4, 4, 5) ← Incorrect

First point of difference

* **First set will be considered in this case.**

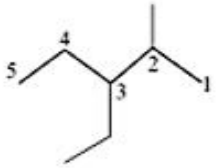


2,4,6-Trimethyldecane *(Correct)*



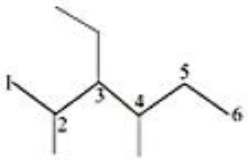
3,4,5-Trimethyldecane *(correct)*

(a) Side chains are always written in alphabetical order.



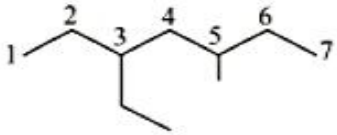
3-Ethyl-2-methylpentane

(b) Di, tri, tetra etc. are not considered in comparing alphabetical order.

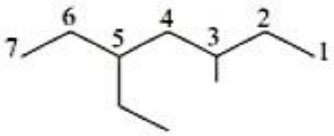


3–Ethyl–2, 4–dimethyl hexane

(c) If lowest set of locants rule is not applicable then numbering is done according to alphabetical order.

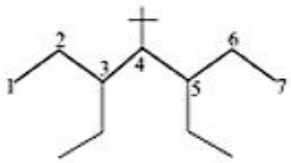


Locant–3, 5 (correct)



Locant–3, 5 (incorrect)

(d) If Di, tri, tetra etc. are part of name of complex name then they considered in alphabetical order.



4-(1,1-Dimethyl)-3, 5-diethylheptane

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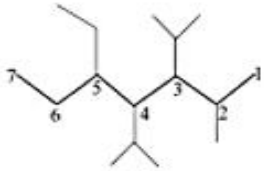
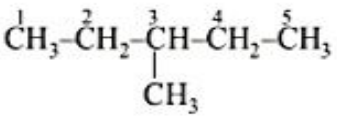
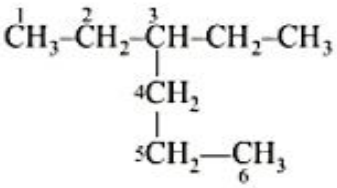
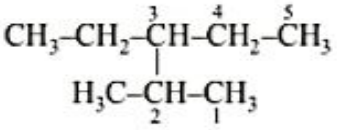
(e)  5-Ethyl-3,4-bis(1-methylethyl)-2-methylheptane

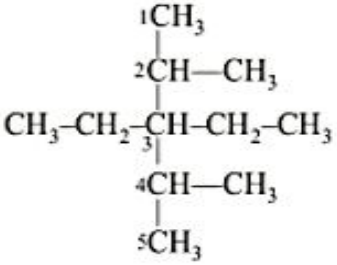
bis , tris, tetrakis are used for complex alkyl substituents

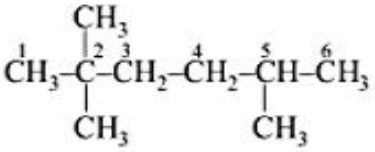
e.g.

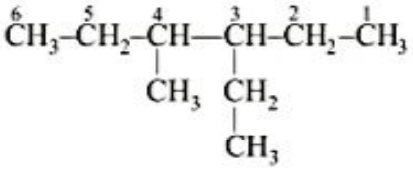
(1)  3-methylpentane

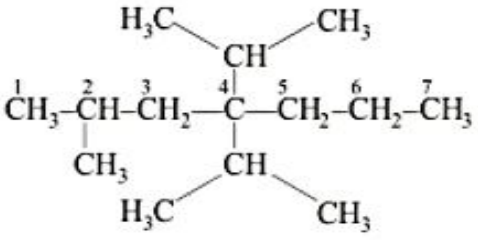
(2)  3-ethylhexane

(3)  3-ethyl-2-methylpentane

(4)  3,3-diethyl-2,4-dimethyl-pentane

(5)  2,2,5-trimethylhexane

(6)  3-Ethyl-4-methylhexane

(7)  2-methyl-4-bis(1-methylethyl)heptane

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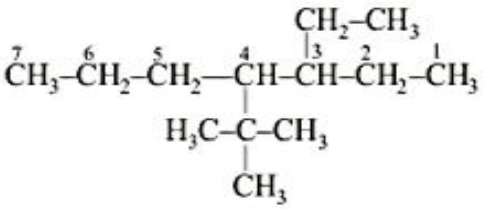
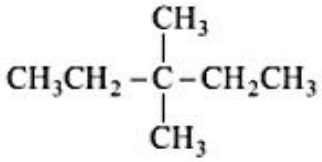
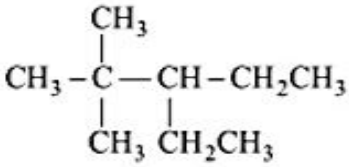
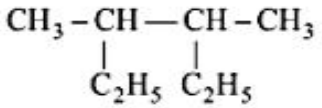
(8)  4-(1,1-dimethylethyl)-3-ethylheptane

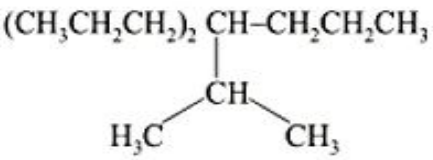
PROBLEMS

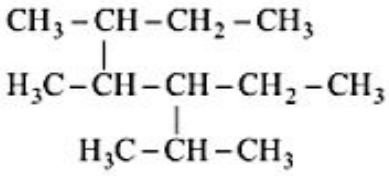
Give IUPAC Name of following compounds :

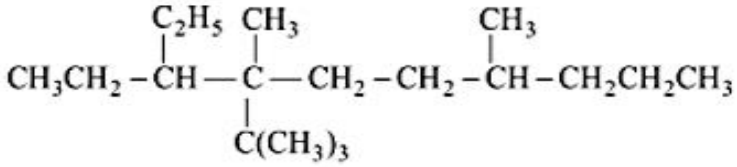
(1) 

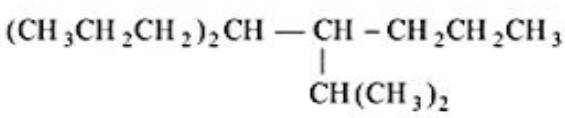
(2) 

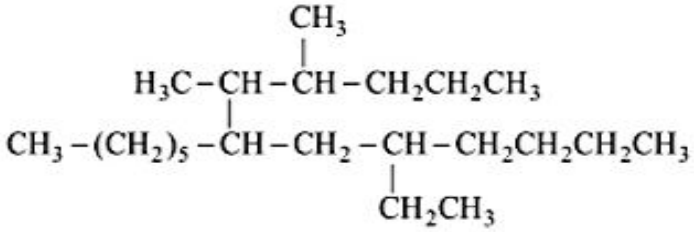
(3) 

(4) 

(5) 

(6) 

(7) 

(8) 

ANSWERS

(1) 3,3-Dimethylpentane
(2) 3-Ethyl-2,2-dimethylpentane
(3) 3,4-Dimethylhexane
(4) 4-(1-methylethyl) – 4 – Propyl heptane
(5) 3-Ethyl-2,4,5-trimethylheptane
(6) 4-(1,1-Dimethylethyl)-3-ethyl-4,7-dimethylhexane
(7) 4-(1-Methylethyl)-5-propyloctane
(8) 7-(1,2-Dimethylpentyl)-5-ethyl tridecane

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UNBRANCHED UNSATURATED HYDROCARBON

Numbering of carbon chain

Rule-1 : If unsaturated bond is present in the molecule at the terminal carbon, then numbering done from the side of unsaturated carbon.

eg. $\overset{1}{CH_2} = \overset{2}{CH} - \overset{3}{CH_2} - \overset{4}{CH_3}$ But–1–ene

eg. $\overset{1}{CH} \equiv \overset{2}{C} - \overset{3}{CH_2} - \overset{4}{CH_3}$ But–1–yne

Rule-2 : If unsaturated bonds like double bond and triple bond is present at terminal carbon, then numbering always done from double bonded terminal carbon.
(Double bond preferred over triple bond when both bonds are at same position)

eg. $\overset{1}{CH_2} = \overset{2}{CH} - \overset{3}{C} \equiv \overset{4}{CH}$ But–1–en–3–yne

Rule-3 : If unsaturated bonds like double bond or triple bond is present at terminal carbon, then numbering is done from either way.

eg. $\overset{1}{CH_2} = \overset{2}{CH} - \overset{3}{CH} = \overset{4}{CH_2}$ But–1, 3–diene

eg. $\overset{1}{CH_2} = \overset{2}{C} - \overset{3}{C} = \overset{4}{CH}$ But–1, 3–diyne

Rule-4 : If triple bond is present at terminal carbon and double bond is located at any carbon except other terminal carbon. Then numbering is done from triple bond.

$\overset{1}{CH} \equiv \overset{2}{C} - \overset{3}{CH} = \overset{4}{CH} - \overset{5}{CH_3}$ Pent – 3 – en – 1 – yne

Rule-5 : If double bond is present at terminal carbon and triple bond is present at any other position except other terminal carbon, then numbering is done from double bonded terminal carbon.

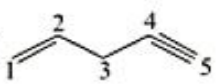
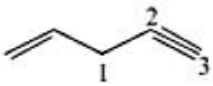
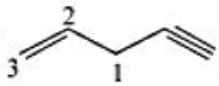
eg. $\overset{1}{CH_2} = \overset{2}{CH} - \overset{3}{C} \equiv \overset{4}{C} - \overset{5}{CH_3}$ Pent – 1 – en – 3 – yne

MCQ

Q.1 Correct IUPAC nomenclature of the given compound 

(A) Hexa–1, 5–dien–3-yne (B) Hex–3–yn–1, 5–diene
(C) Hex dieneyne (D) Hexeneyne

Q.2 Which is the correct order for numbering in the given compound.

(A)  (B)  (C)  (D) 

Q.3 Write correct IUPAC name for given compound.

(A) Hexa–2, 4–diyne (B) But–2, 4–diyne (C) Pent–2, 4–diyne (D) Tetra–2, 4–diyne

Q.4 Which is correct structure for penta–1, 4–diyne

(A)  (B)  (C)  (D) 

ANSWERS

Q.1 (A) Q.2 (A) Q.3 (A) Q.4 (A)

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BRANCHED UNSATURATED HYDROCARBON

Longest chain :

Rule-1 : If unsaturated bonds like double bond or triple bond is present in the molecule, then that parent chain is considered which is containing unsaturated bonds like double bond or triple bond.

eg. $\overset{7}{CH_3}-\overset{6}{CH_2}-\overset{5}{CH_2}-\overset{4}{CH_2}-\overset{3}{CH}(-\overset{2}{CH}=\overset{1}{CH_2})-CH_2-CH_2-CH_3$ ⟶ Parent chain

eg. $\overset{6}{CH_3}-\overset{5}{CH}=\overset{4}{CH}-\overset{3}{CH}(-\overset{2}{CH}=\overset{1}{CH_2})-CH_2-CH_2-CH_3$

Rule-2 : A primary suffix is added to the word root to indicate presence at double or triple bond in the parent chain.

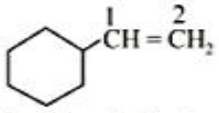
For one double bond = Word root + locant + ene
For one triple bond = Word root + locant + yne

In case the parent chain contains two or more double bonds, the prefixes di, tri, tetra, etc. are used before primary suffix.

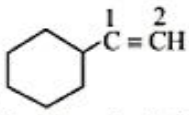
For two double bonds = Word root + locant + diene
For two triple bonds = Word root + locant + diyne

Numbering of carbon chain :

Rule-1 : In branched alkene, select that parent chain which is containing maximum unsaturated double bond or triple bond and follow properly of lowest locant rule.

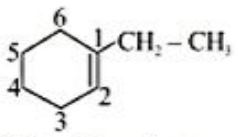
eg. 
Cyclohexyl eth -1-ene

eg. $\overset{1}{CH_3}-\overset{2}{CH}=\overset{3}{C}(-\overset{4}{CH}(-\overset{5}{CH}(-\overset{6}{CH_2}-\overset{7}{CH_3})-CH_3)-CH_3)$
4, 6-dimethyl hept-2-ene

eg. 
Cyclohexyl eth -1-yne

eg. $CH_3-CH_2-CH_2-CH_2-\overset{4}{C}(-\overset{3}{CH_2}-\overset{2}{CH}=\overset{1}{CH_2})=\overset{5}{CH}-\overset{6}{CH_3}$
4–Butylhexa-1-4-diene

Rule-2 : In branched alkene, if unsaturated double bond or triple bond is present in the cyclic ring, then numbering is done from double bonded carbon of the cyclic ring and follow lowest locant rule properly.

eg. 
1-ethyl cyclohex-1-ene

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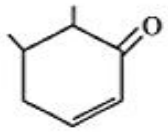
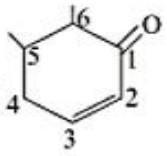
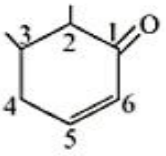
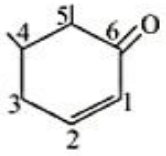
MCQ

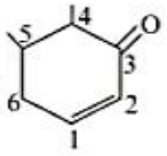
Q.1 Which is the correct way of number in the given compound.



(A) 

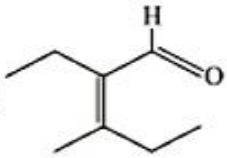
(B) 

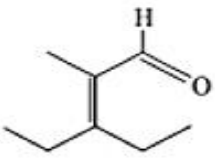
(C) 

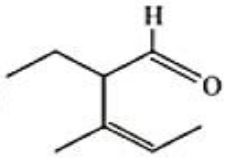
(D) 

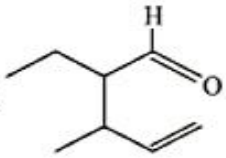
Q.2 Which is the correct structure for given IUPAC name

2–Ethyl–3–methyl Pent–2–en–1–al

(A) 

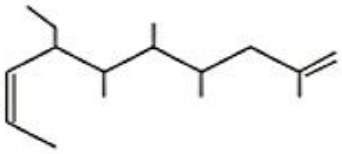
(B) 

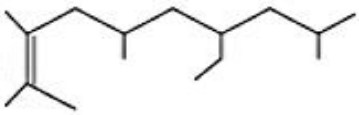
(C) 

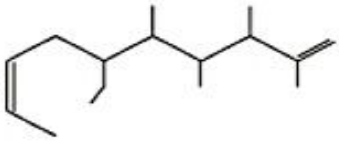
(D) 

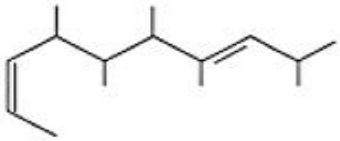
Q.3 Which is the correct structure for given IUPAC name.

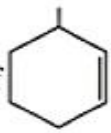
7–ethyl–2, 4, 5, 6–tetramethyl deca–1,8–diene

(A) 

(B) 

(C) 

(D) 

Q.4 The IPUAC name of  is

(A) 3–methyl cyclohexene
(B) 1–methyl cyclohex–2–ene
(C) 6–methyl cyclohexene
(D) 1–methyl cyclohex–5–ene

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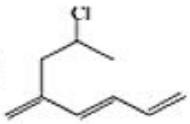
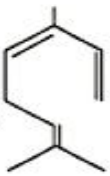
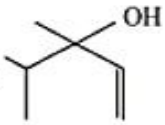
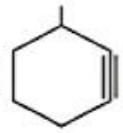
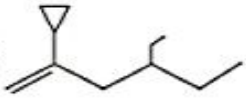
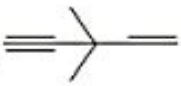
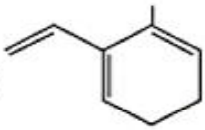
Q.5 Which is correct match.

	IUPAC Name	Structure
(A)		2–(2'–chloropropyl) hexa–1,3,5–triene
(B)		3, 7–dimethyl hepta–1, 3–6–triene
(C)		3, 4–dimethyl pent–1–en–2–ol
(D)		3–methyl cyclopent–1–yne

Q.6 Which is incorrect match in the following-

	Structure	IUPAC NAME
(A)		Octa –1– en–4–yne
(B)		4–Ethyl –2–Cyclopropylhex–1–ene
(C)		3, 3–dimethyl pent–1–en–4–yne
(D)		2–methyl–3–ethenyl cyclohexa–1, 3–diene

ANSWERS

Q.1 (A) Q.2 (A) Q.3 (A) Q.4 (A) Q.5 (A) Q.6 (D)

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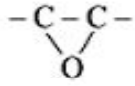
IUPAC NAMING OF ORGANIC COMPOUND CONTAINING FUNCTIONAL GROUPS

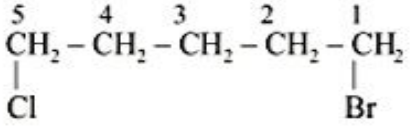
In IUPAC nomenclature functional groups are categorized into two type.

Type I : Groups of this type are not considered as functional groups in IUPAC nomenclature. They are considered as substituents & therefore represented by prefix. type I functional group & their prefix are shown below:

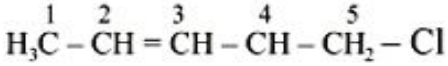
Groups	Prefix
– F	fluoro
– Cl	chloro
– Br	bromo
– I	iodo
$-NO_2$	nitro
– NO	nitroso
– OR	alkoxy
	epoxy

Rules for their nomenclature :

Rule I : If two substituents are present on same position from different ends, then priority is decided on the basis of alphabetical order.

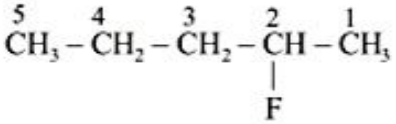


Rule II : If multiple bond and type I functional group both are present, the priority is given to multiple bond.



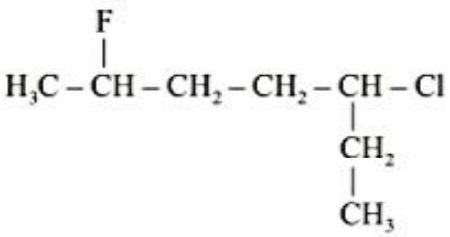
Rule III : These groups are written is alphabetical order in IUPAC name.

eg. (i)



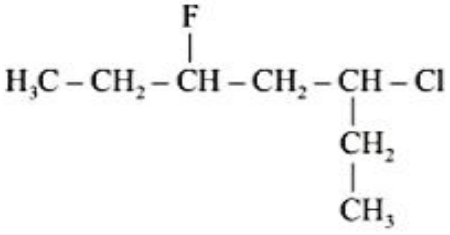
2-fluoropentane

(ii)



5-chloro-2-fluoroheptane

(iii)



3-chloro-5-fluoroheptane

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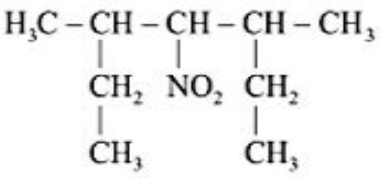
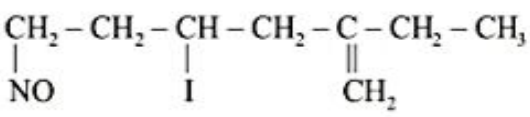
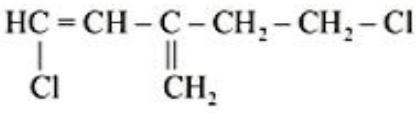
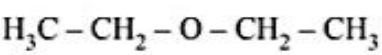
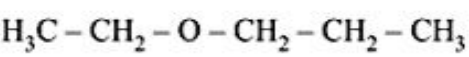
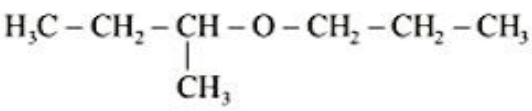
(iv)  3, 5-dimethyl-4-nitro heptane

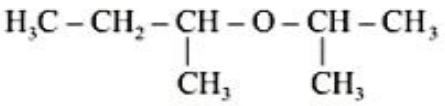
(v)  2-ethyl-4-iodo-6-nitroso hex-1-ene

(vi)  1-chloro-3-chloroethylbuta-1, 3-diene

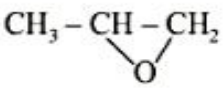
(vii)  ethoxy ethane

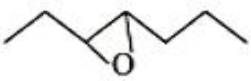
(viii)  1-ethoxy propane

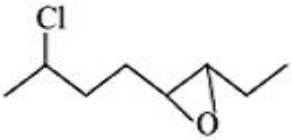
(ix)  2-propoxy butane

(x)  2-(methyl ethoxy) butane or 2-isopropoxy butane

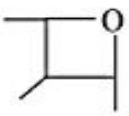
Epoxides :

(1)  1, 2-epoxy propane

(2)  3, 4-epoxy heptane

(3)  2-chloro-5, 6-epoxy octane

(4)  1, 3-epoxy propane

(5)  2, 4-epoxy-3-methyl pentane

Type-II : Groups of this type are treated as functional groups and represented by suffix in IUPAC nomenclature. Priority table for functional group.

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S.No.	Functional group	Name	Suffix	Prefix
(1)	$-\overset{\overset{O}{\|\|}}{C}-OH$	Carboxylic acid	oic acid	Carboxy
(2)	$-SO_3H$	Sulphonic acid	sulphonic acid	Sulpho
(3)	$-\overset{\overset{O}{\|\|}}{C}-O-\overset{\overset{O}{\|\|}}{C}-$	Acid anhydride	oic anhydride	–
(4)	$-\overset{\overset{O}{\|\|}}{C}-OR$	Ester	oate (alkyl+w.r.+oate)	Alkoxy carbonyl
(5)	$-\overset{\overset{O}{\|\|}}{C}-Cl$	Acid chloride	oyl chloride	Chlorocarbonyl
(6)	$-\overset{\overset{O}{\|\|}}{C}-NH_2$	Amide	amide	Carbamoyl
(7)	$-C\equiv N$	Cyanide	nitrile	Cyano
(8)	$-N\equiv C$	Isocyanide	isonitrile	Isocyano
(9)	$-CHO$	Aldehyde	al	oxo / formyl
(10)	$-\overset{\overset{O}{\|\|}}{C}-$	Ketone	one	Oxo/Keto
(11)	$-OH$	Alcohol	ol	Hydroxy
(12)	$-SH$	Thio-alcohol	thiol	Mercapto
(13)	$-NH_2$	Amine	amine	Amino
(14)	$(=)$		ene	
(15)	$(\equiv)$		yne	

Note : Double bond & triple bond are not true functional groups.
w.r. → Word Root

Rule for their nomenclature :

(1) Selection of parent 'C' chain : longest possible 'C' chain with functional group and having maximum number of multiple bonds is selected as parent 'C' chain.

$$CH_3-CH_2-\boxed{CH-CH_2-CH_2-CH_3}$$
$$\qquad\qquad\qquad\qquad\quad \boxed{C}OOH$$

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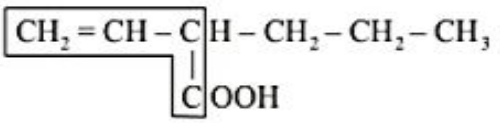
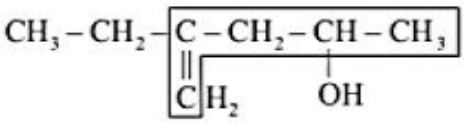



(2) Numbering :

(a) Numbering starts from the side of functional group for numbering priority order is given below :

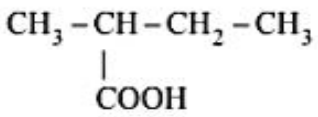
Functional group > Multiple bonds > Substituents

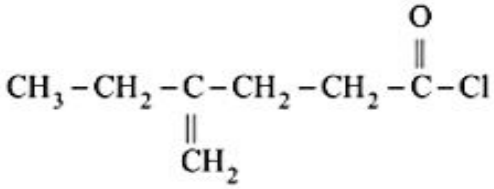
(b) If chain ending 'C' containing functional group is present then numbering starts from the 'C' of functional group these functional groups are known as DON category functional groups functional groups of this category are shown below :

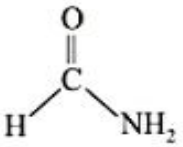
Rule 3 : 'e' of primary suffix is dropped if secondary suffix starts from a vowel.

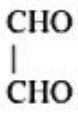
Example of compounds having don category functional groups :

(i) $CH_3 - CH_2 - CH_2 - COOH$ — Butanoic acid

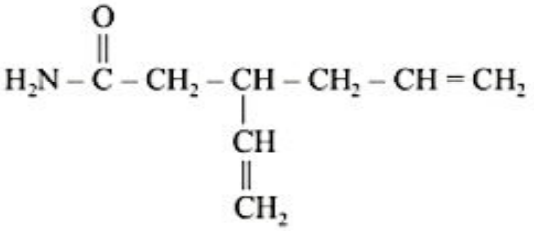
(ii)  — 2-methyl butanoic acid

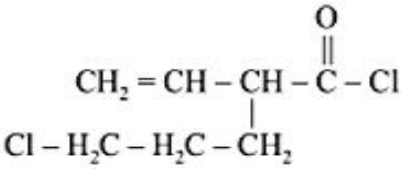
(iii)  — 4-ethyl pent-4-en-1-oylchloride

(iv)  — methanamide

(v)  — ethandial

(vi) $NC - CH_2 - CH_2 - CH_3$ — butane nitrile

(vii)  — 3-ethenyl hex-5-en-1-amide

(viii)  — 2-(3-chloropropyl) but-3-en-1-oyl chloride

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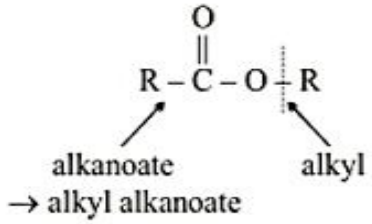
Ester :



e.g.

(i) $CH_3-C(=O)-O-CH_3$ — Methyl ethanoate

(ii) $H-C(=O)-O-CH_3-CH_3$ — ethyl methanoate

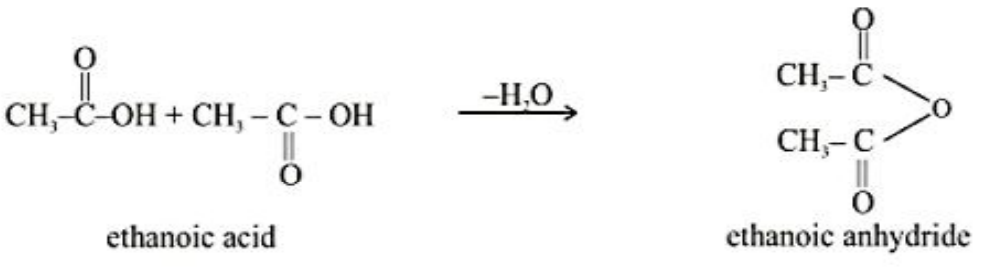
(iii) $CH_3-CH(CH_2-Cl)-CH_2-C(=O)-O-CH_3$ — methyl-4-chloro-3-methyl butanoate

(iv) $Cl-CH_2-O-C(=O)-CH_3$ — chloromethylethanoate

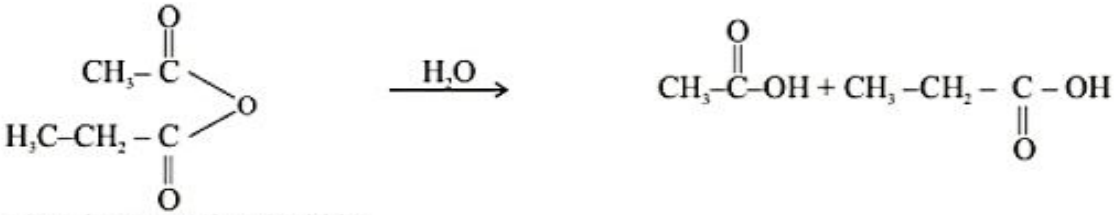
(v) $H_3COOCCH_3$ — methyl ethanoate

(vi) $H_3C-H_2C-CH(CH_2-C(=O)-O-CH_3)-C(=O)-O-CH_3$ — methyl-2-ethyl butane-1, 4-dioate.

Anhydride : Nomenclature of anhydride is done on the basis of the carboxylic acid from which it is obtained.



ethanoic acid — ethanoic anhydride



ethanoic propanoic anhydride

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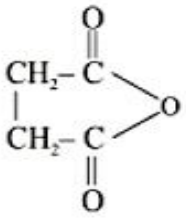
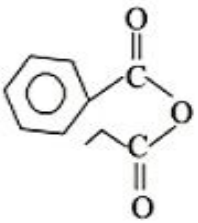
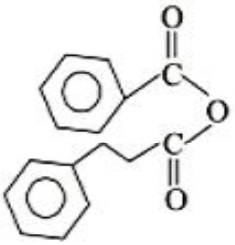


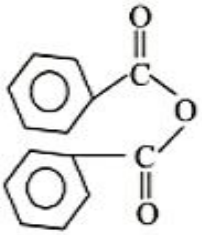
butanedioic anhydride



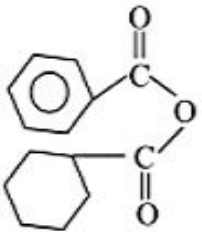
Benzene carboxylic
propanoic anhydride



Benzene carboxylic-3-phenyl
propanoic anhydride

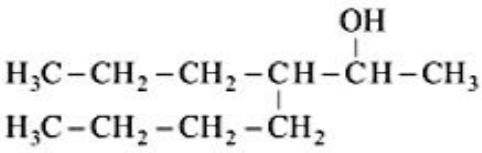


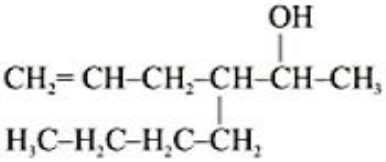
Benzene carboxylic anhydride



Benzene carboxylic cyclohe
carbocyclic anhydride

Example of compounds having functional group other than DON category :

1.  (3–propylheptan–2–ol)

2.  3–butyl hex–5–en–2–ol

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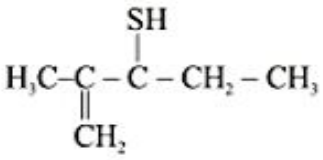
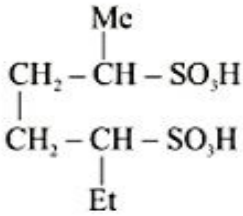
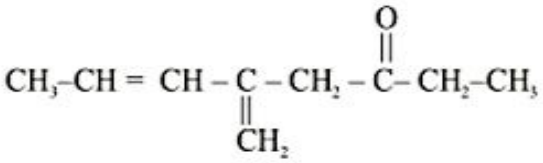
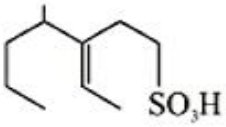
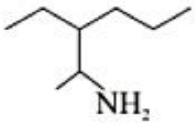
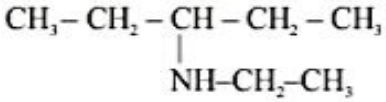
3.  2–methylpent–1–ene–3–thiol

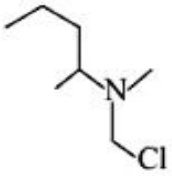
4.  heptane–2, 5–disulphonic acid

5.  5–methylene oct–6–en–3–one

6.  3–(1–methyl butyl) pent–3–ene–1–sulphonic acid

7.  3–ethylhexan–2–amine

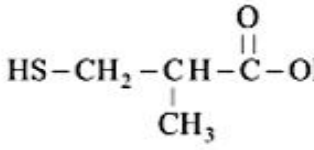
8.  N–ethyl pentan–3–amine

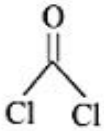
9.  N–Chloromethyl–N–methyl pentan–2–amine

POLYFUNCTIONAL COMPOUNDS

Rule-I : If more than one functional groups are present then one is selected as principal functional group and represented by suffix. Other functional groups are treated as substituents & represented by prefix.

Selection of principal functional group is done according to priority table

1.  (3–mercapto–2–methylpropanoic acid)

2.  chloromethanoylchloride

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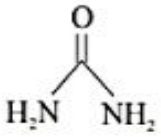
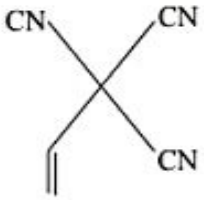
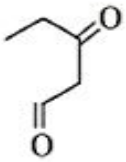
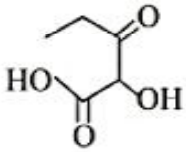
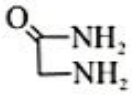
3.  amino methanomide (Urea)

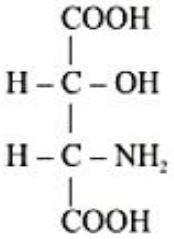
4.  2–ethenyl–2–isocyano propane–1,3–dinitrite

5.  3–oxo pentanal

6.  2-hydroxy-3-oxo pentanoic acid

7.  2–amino ethanomide

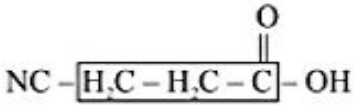
Rule-II : When principal group is selected then there is no use of priority table.

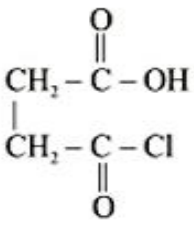
8. 

3–amino–2–hydroxy butane – 1, 4–dioic acid (Incorrect)

2 – amino – 3– hydroxybutane –1, 4–dioic acid (Correct)

Rule-III : If any DON functional group is present as sec. functional group then its 'c' is not included in principal 'c' chain except –CHO group.

9.  3–cyanopropanoic acid

10.  3-Chloro carbonylpropanoic acid

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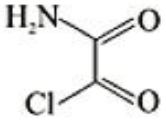
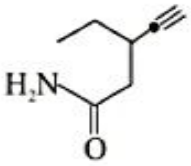
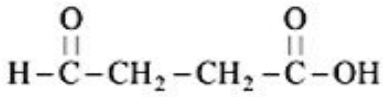
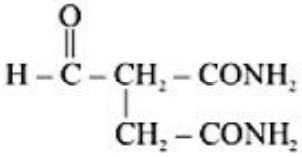
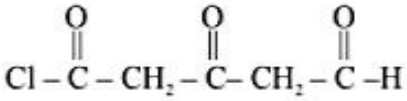
11.  Carbamoyl methanoyl chloride

12.  3-Ethylpent-4-yn-1-amide

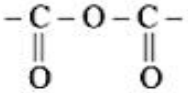
Rule-IV : As secondary functional group, if 'C' of –CHO group is included in percent 'c' chain then oxo is used as prefix, otherwise we use formyl group as prefix.

13.  4–oxobutanoic acid

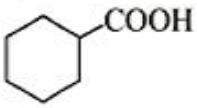
14.  2–formyl butane–1, 4–diamide

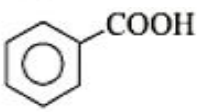
15.  3, 5–dioxopentanoyl chloride

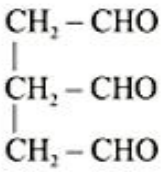
IUPAC nomenclature if DON category functional group is present as principal functional group & its 'c' is not included in parent 'c' chain →

– COOH	Carboxylic acid
	Carboxylic anhydride
– COOR	Carboxylate
– COCl	Carbonyl chloride
– $CONH_2$	Carboxamide
– CN	Carbonitrile
– CHO	Carbaldehyde

e.g.

1.  Cyclohexane carboxylic acid

2.  Benzene carboxylic acid

3.  Propane–1, 2, 3–tricarbadehyde

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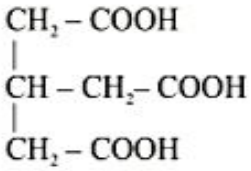
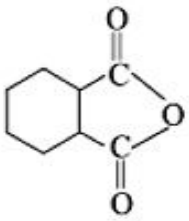
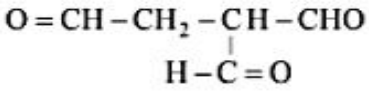
4. 
3–Carboxymethyl pentane–1, 5–dioic acid

5. 
Cyclohexane-1, 2–dicarboxylic anhydride

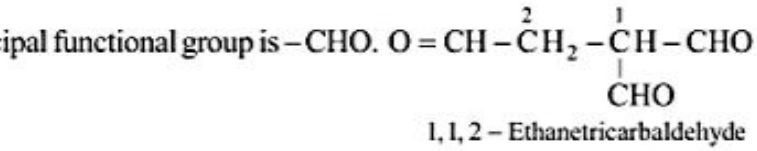
SOLVED EXAMPLES

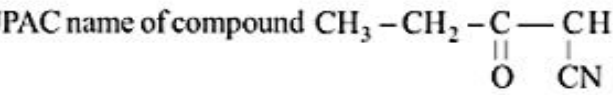
Q.1 The correct IUPAC name of the following compound is



(A) 1, 1–diformyl propanal
(B) 3–formyl butanedial
(C) 2–formyl butanedial
(D) 1,1,2–ethane tricarbaldehyde

Ans. D

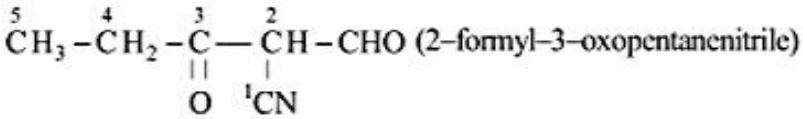
Sol. The principal functional group is –CHO. 
1, 1, 2 – Ethanetricarbaldehyde

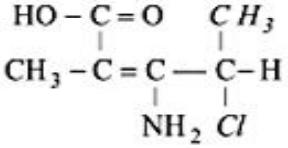
Q.2 The correct IUPAC name of compound  is :

(A) 2–cyano–3–oxopentanal
(B) 2–formyl–3–oxopentanenitrile
(C) 2–cyano–1, 3–pentanediaone
(D) 1, 3–dioxo–2–cyanopentane

Ans. B

Sol. Here the main functional group is –CN, which had nitrile suffix and CHO and CO are taken as substituents.


(2–formyl–3–oxopentanenitrile)

Q.3 The IUPAC name of compound  is

(A) 2–amino–3–chloro–2–methyl–2–pentenoic acid
(B) 3–amino–4–chloro–2–methyl–2–pentenoic acid
(C) 4–amino–3–chloro–2–methyl–2–pentenoic acid
(D) none of these

Ans. B

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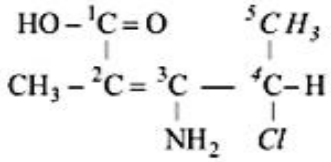
Sol. The principal functional group is carboxylic acid (–COOH)



3 - amino - 4 - chloro - 2 - methyl - 2 - pentenoic acid

Q.4 IUPAC name of compound $CH_3CH_2O\overset{\overset{O}{\|}}{C}CH_2CH_2CH_3$ is

(A) Propyl propanoate (B) Ethyl butanoate
(C) Propyl butanoate (D) Ethyl propanoate

Ans. **B**

Sol. $CH_3-CH_2-O-\overset{1}{C}-\overset{2}{C}H_2-\overset{3}{C}H_2-\overset{4}{C}H_3$

MCQ

Q.1 The IUPAC name of the compound having structure $ClCH_2–CH_2–COOH$ is :

(A) 3–Chloro propanoic acid (B) 2–Chloro propanoic acid
(C) 2–Chloro ethanoic acid (D) Chloro succinic acid

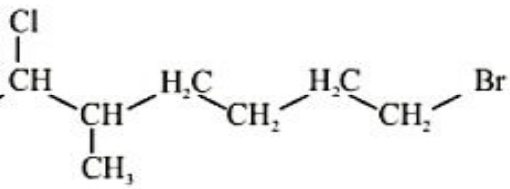
Q.2 The IUPAC Name of compound $CH_3-\overset{\overset{OH}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_2-OH$ is :

(A) 2–Methyl–1, 2–propanediol (B) Isobutylene glycol
(C) 1-2–Dihydroxy–2–Methyl propane (D) 2–Hydroxy methyl–2–propanol

Q.3 The IUPAC name of $CH_3-\overset{\overset{CH_3}{|}}{CH}-\overset{\overset{O}{\|}}{C}-CH_2-CH_2OH$ is -

(A) 1–Hydroxy–4–methyl–3–pentanone (B) 2–Methyl–5–hydoxy–3–pentanone
(C) 4–Methyl–3–oxo–1–pentanol (D) Hexanol–1–one–3

Q.4 IUPAC name of



(A) 2–Chloro–3–methyl–7–bromo heptane (B) 7–Bromo–2–chloro–3–methyl heptane
(C) 1–Bromo–5–methyl–6–chloro heptane (D) 1–Bromo–6–chloro–5–methyl heptane

Q.5 IUPAC name of $CH_2=CH–CH_2–Cl$ is :

(A) Allyl cloride (B) 1–Chloro–3–propene
(C) 3–Chloro–1–propene (D) Vinyl chloride

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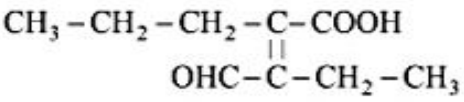
Q.6 The correct IUPAC name for $CH_3CH=C(COOH)CH_2CH_3$ is :

(A) 3–Carboxy–2–pentene
(B) 2–Ethylidene butanoic acid
(C) 2–Ethyl–2–butenoic acid
(D) 3–Ethyl–2–buten–4–oic acid

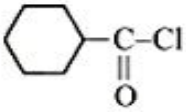
Q.7 The number of carbon atoms in the principal chain of the given compound are :



(A) 7 (B) 5 (C) 4 (D) 6

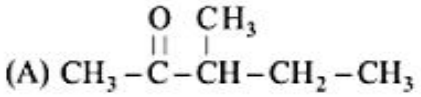
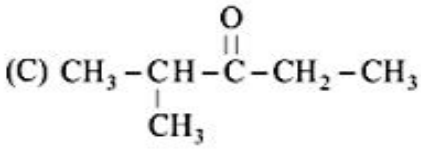
Q.8 The IUPAC name of $CH_3–CH_2–NH–CH_3$ is :

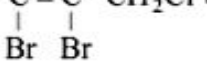
(A) Methyl ethyl amine
(B) 1–methyl ethan amine
(C) N–methyl ethan amine
(D) N–ethyl methanamine

Q.9 The name for the structure 

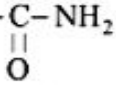
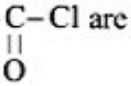
(A) Cyclo hexanoyl chloride
(B) Cyclohexane carbonyl chloride
(C) 1–Chloro cyclohexanal
(D) Chloro cyclohexyl methanal

Q.10 3–Methyl–2–pentanone is :

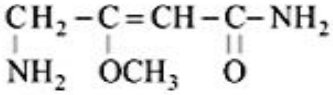
(A) 
(B) 
(C) 
(D) $CH_3–CH_2–CH=CH_2$

Q.11 The name of  according to IUPAC nomenclature system is :

(A) 2, 3–Dibromo–1,4–dichloro–2–butene
(B) 1,4–Dichloro–2,3–dibromobutene–2
(C) Dichloro dibromo butene
(D) Dichloro dibromo butene

Q.12 The systematic IUPAC name for  and  are :

(A) 1–Amino–1–oxo ethane, 1–chloro ethanal
(B) 1–Amono ethanal, acetoy chloride
(C) 1–Oxoethanamine, ethanoyl chloride
(D) Ethanamide, Ethanoyl chloride

Q.13 The IUPAC name of the compound  is :

(A) 4–Amido–2–methoxy–1–amino–2–butene
(B) 4–Amino–3–methoxy–2–butenamide
(C) 2–Methoxy–1, 4–diamino–2–butenal
(D) 1–Amino–2–methoxy–3–amido propene

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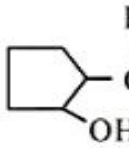
Q.14 The correct name for  is :

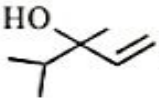
(A) 2–Hydroxy cyclopentanal
(B) 2–Formyl–1–hydroxy cyclopentane
(C) 2–Hydroxy cyclopentane carbaldehyde
(D) Cyclopentane–2–ol–1–al

Q.15 The IUPAC name of $Cl-\underset{\underset{O}{||}}{C}-OC_2H_5$ is :

(A) Ethoxy formyl chloride
(B) Ethoxy methanoyl chloride
(C) Ethyl chloro methanoate
(D) Ethoxy carbonyl chloride

Q.16 IUPAC name of $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-\underset{\underset{CN}{|}}{CH}-CH_3$ is :

(A) 2–cyano–3–methyl hexane
(B) 3–methyl–5–ctabigexabe
(C) 2-4-Dimethyl pentanenitrile
(D) 2–cyano–3–methylhexane

Q.17  has the IUPAC name :

(A) 3,4–Dimethyl–1–penten–3–ol
(B) Isopropyl–3–methyl vinyl carbinol
(C) 2,3–Dimethyl–4–penten–3–ol
(D) None of the above

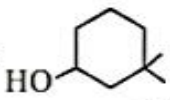
Q.18 Which of the following compound has wrong IUPAC name ?

(A) $CH_3CH_2-CH_2COO-CH_2CH_3$
(Ethyl *butanoate)*

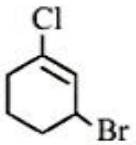
(B) $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-CHO$
(3 – Methylbutanal)

(C) $CH_3-\underset{\underset{OH}{|}}{CH}-\underset{\underset{CH_3}{|}}{CH}-CH_3$
(2 – Methyl – 3 – butanol)

(D) $CH_3-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{O}{||}}{C}-CH_2-CH_3$
(2 – Methyl – 3 – pentanone)

Q.19 The IUPAC name of the compound  is :

(A) 1, 1–dimethyl–3–cyclohexanol
(B) 1, 1–dimethyl–3–hydroxy cyclohexane
(C) 3, 3–dimethyl–1–cyclohexanol
(D) 3, 3–dimethyl–1–hydroxy cyclohexane

Q.20 The IUPAC name of the compound is 

(A) 6–bromo–2–chlorocyclohexene
(B) 3–bromo–1–chlorocyclohexene
(C) 1–bromo–3–chlorocyclohexene
(D) 2–bromo–6–chlorocyclohex–1–ene

ANSWERS

Q.1 (A) Q.2 (A) Q.3 (A) Q.4 (D) Q.5 (C) Q.6 (C) Q.7 (B) Q.8 (C) Q.9 (B) Q.10 (A) Q.11 (A)
Q.12 (D) Q.13 (B) Q.14 (C) Q.15 (C) Q.16 (C) Q.17 (A) Q.18 (C) Q.19 (C) Q.20(B)

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NOMENCLATURE OF ALICYCLIC COMPOUNDS

(A) Unsubstituted cyclo compounds : Prefix + word root + suffix
Cyclo + no. of C + ane / ene

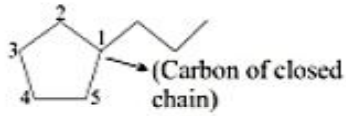
Example :  Cyclopropane  Cyclobutane  Cyclohexene

(B) Substituted cyclic compound (closed + open chain saturated)

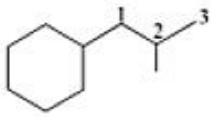
Rule :

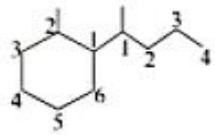
(i) If number of carbons in closed chain ≥ no. of carbons in open saturated chain, then closed chain will be selected as parent chain.

Example : 
1-methyl cyclo propane

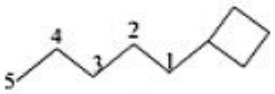


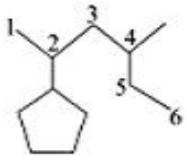
Propyl cyclo pentane

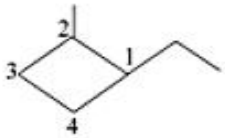

1-(2-methyl propyl) cyclohexane

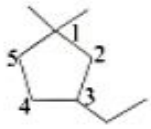

1-(1-methyl butyl)-2-methyl cyclohexane

(ii) If number of carbons in open chain > closed chain ⇒ Open chain is parent chain


1-cyclobutyl pentane

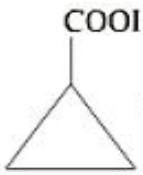

2-cyclopentyl-4-methyl hexane


1-ethyl-2-methyl cyclobutane

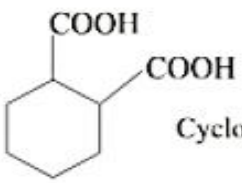

3-ethyl-1,1-dimethyl cyclopentane

Rule :

Cyclic compounds with functional group is considered as parent chain :

(i) 

Cyclopropane carboxylic acid



Cyclohexane-1,2-dicarboxylic acid

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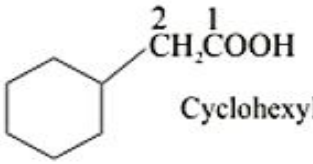
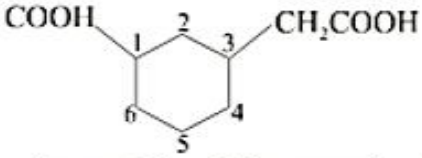
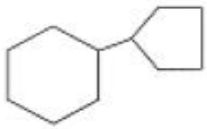


Cyclohexyl ethanoic acid

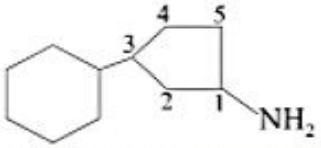
→ If FG (–COOH) present on both cyclic and non-cyclic then number of carbon atoms is considered.



3-carboxymethyl cyclohexane carboxylic acid



cyclopentyl cyclohexane

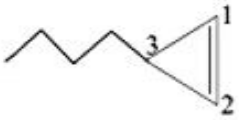


3-cyclohexyl cyclopentane amine

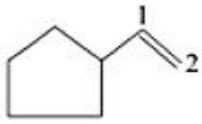
If unsaturation (Multiple bond) present

Rule :

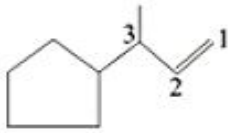
Chain containing multiple bond is selected as parent chain



3-butyl cyclopropene

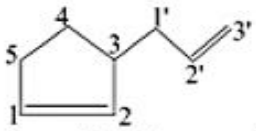


1-cyclopentyl ethene



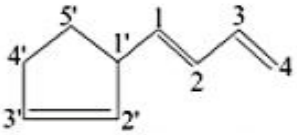
3-cyclopentyl but–1–ene

If ring and non-cyclic side chain both containing double bond then check the number of C atoms and given parent chain.



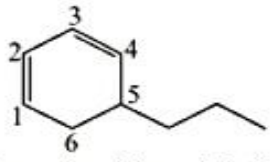
3-(prop-2-enyl) cyclo pent-1-ene

Number of double bond is considered while selecting parent chain



1-(cyclopent-2-enyl) buta-1,3-diene

In case of more than one multiple bond use suffix 'a' after word root.



5-propyl cyclohexa-1, 3-diene

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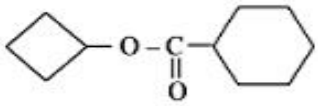
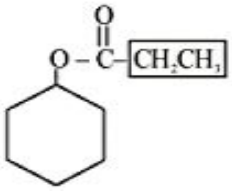
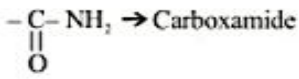


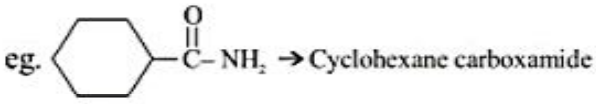
(Parent chain)

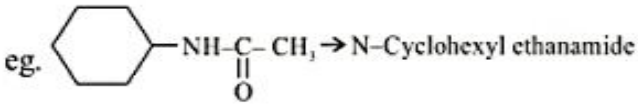
Cyclobutyl cyclohexane carboxylate

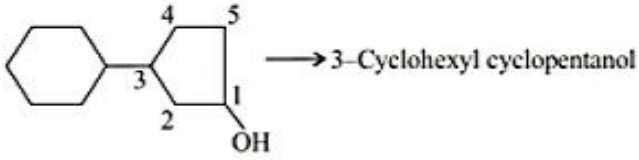


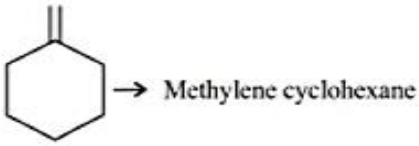
Cyclohexyl ethane carboxylate





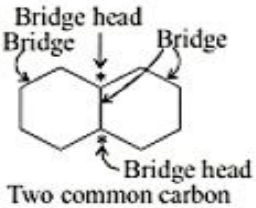




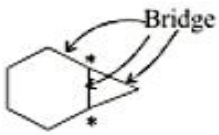


NOMENCLATURE OF BICYCLO COMPOUNDS

Bicyclo compounds : If two rings are fused at two common carbon atoms then compound are known as bicyclic compound.



Two common carbon



Bridge should be present

(i) Unsubstituted bicyclo compounds

Prefix	+	Numbering of carbon atoms in each bridge in decreasing order	+	Suffix
Bicyclo				

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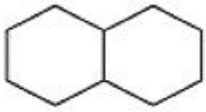
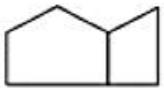


Biyclo (4.4.0) decane
(Bridge head C not considered)

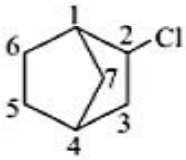
eg.  Bicyclo [2.2.0] Hexane

eg.  Bicyclo [2,1,1] Hexane

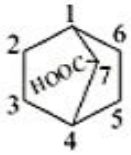
eg.  Bicyclo [3,2,0] Heptane

(ii) Substituted bicyclo (Bicyclo with subtitution or functional group)

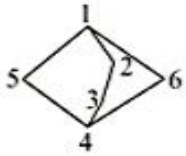
In substituted bicyclic compounds numbering starts from a bridge head carbon atom and proceeds towards longest bridge then smaller bridge & then smallest bridge.



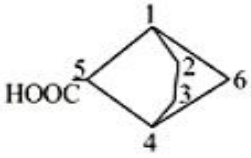
2–Chloro bicylo [2.2.1] heptane

eg. 

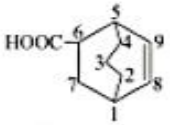
bicylo [2.2.1] heptane–7–carboxylic acid

eg. 

Bicyclo [2.1.1] hexane



Bicyclo [2.1.1] hexane–5–carboxylic acid



F.G. is preffered over double bond.
Bicyclo [3.2.2] dec–9–en–carboxylic acid

Bicyclo [3.2.2] non–8–ene–6–carboxylic acid

NOMENCLATURE OF SPIRO COMPOUNDS

Spiro comp. - Two cyclic rings are fused at one common carbon (only one bridge head)

Spiro

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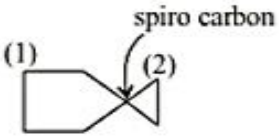
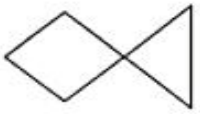
eg. 

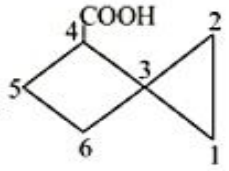
Name : Prefix + no. of carbon in bridges in increasing order + suffix
Spiro [2. 4] heptane

eg 
Spiro

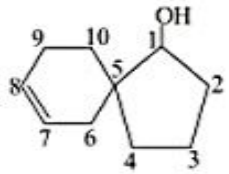
Spiro [2.3] hexane


Spiro [4. 5] decane

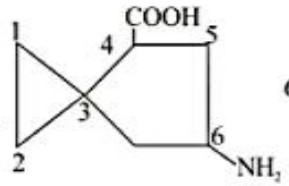
Rule for numbering : - In spiro compounds numbering starts from carbon of smaller ring which is next to spiro carbon proceeds towards other carbon atoms of smaller ring then towards larger ring via spiro carbon atom.

eg. 

Spiro [2.3] hexane–4–carboxylic acid

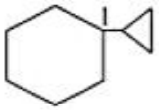
eg. 

Spiro [4.5] dec–7–en–1–ol

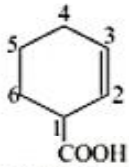
eg. 

6–amino spiro [2, 4] heptane–4–carboxylic acid

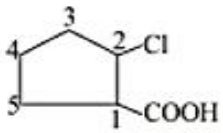
eg.

(1) 

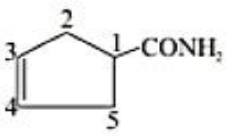
Cyclopropyl cyclohexane

(2) 

Cyclohex-2-ene-1-carboxylic acid

(3) 

2-Chloro cyclopentane carboxylic acid

(4) 

Cyclopent-3-ene-1-carboxamide

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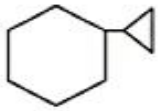
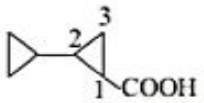
(5)



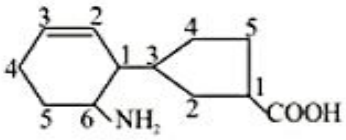
Cyclopropyl cyclohexane

(6)



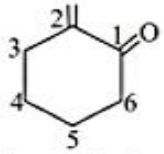
2-cyclopropyl cyclopropane carboxylic acid

(7)



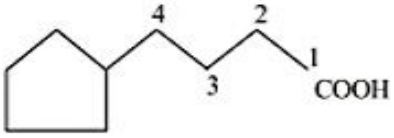
3-(6-amino cyclohex-2-enyl) cyclopentane carboxylic acid

(8)



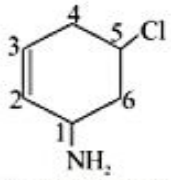
2-methylene cycloehexan-1-one

(9)



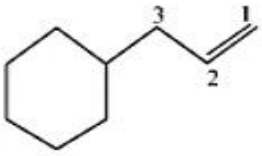
4-Cyclopentyl butanoic acid

(10)



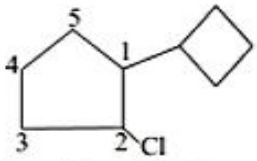
5-Chloro cyclohex-2-en-amine

(11)



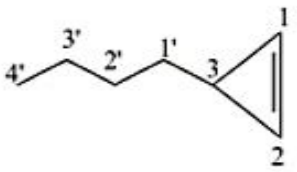
3-cyclohexyl prop-1-ene

(12)



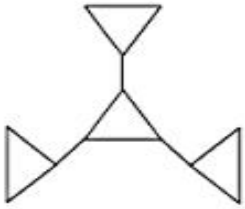
1–cyclobutyl-2-chloro cyclopentane

(13)



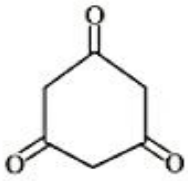
3-butyl cyclopropene

(14)



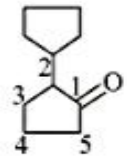
1, 2, 3–tricyclo propyl cyclopropane

(15)



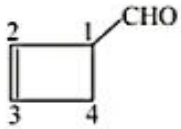
Cyclohexane-1, 3, 5-trione

(16)



2–cyclopentyl cyclo pentanone

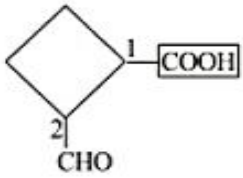
(17)



Cyclobut-2-ene-carbaldehyde

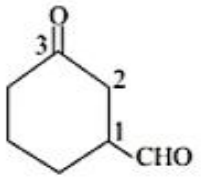
Rule : - If more than one functional group is present at cyclic chain, then principal function group (PFG) is selected

eg.



2-formyl cyclobutane carboxylic acid

eg.



3–oxo cyclohexane carbaldehyde

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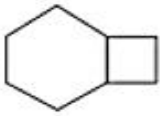
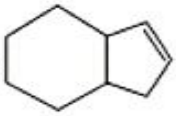
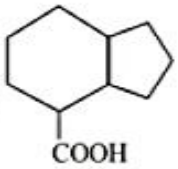
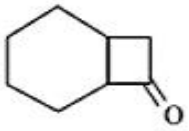
PROBLEMS

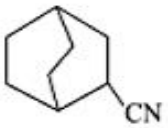
Write the IUPAC Nomenclature of following compounds :

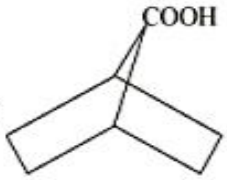
(1) 

(2) 

(3) 

(4) 

(5) 

(6) 

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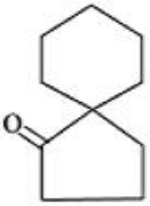
(8) 

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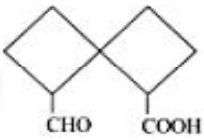
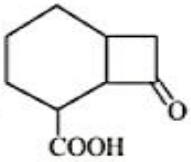
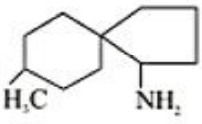
(10) 

(11) 

(12) 

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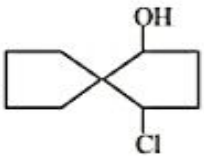
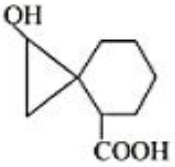
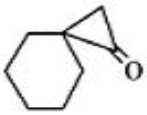
(14) 

(15) 

(16) 

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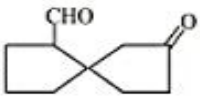
(18) 

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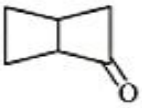
(20) 

ANSWER

(1) bicyclo [4.2.0] octane
(2) bicyclo [4.3.0] non–7–ene
(3) bicyclo [4.3.0] nonane–2–carboxylic acid
(4) bicyclo [4.2.0] octane–7–one
(5) bicyclo [2.2.2] octane–2–carbnitrile
(6) bicyclo [2.2.1] heptane-7- carboxylic acid
(7) spiro [2.2.0] penta-1, 4-diene
(8) spiro [4.5] decan–1–one
(9) spiro [2.3] hexane
(10) 5-formyl spiro [3.3] heptane–1–carboxylic acid
(11) 8-oxo bicyclo [4.2.0] octane–2–carboxylic acid
(12) 8-methyl spiro [4.5] decan–1–amine
(13) 1-chloro spiro [5.5] undecane
(14) 4-chloro spiro [4.4] nonan–1–ol
(15) 1-hydroxy spiro [2.5] octane–4–carboxylic acid
(16) spiro [2.5] octan–1–one
(17) bicyclo [3.2.0] hept–6–ene–2–carboxamide
(18) 7-oxo spiro [4.4] nonane–1–carbaldehyde
(19) spiro [2.5] octane–1–carbaldehyde
(20) bicyclo [2.2.0] hexan–2–one

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