# CHAPTER 1

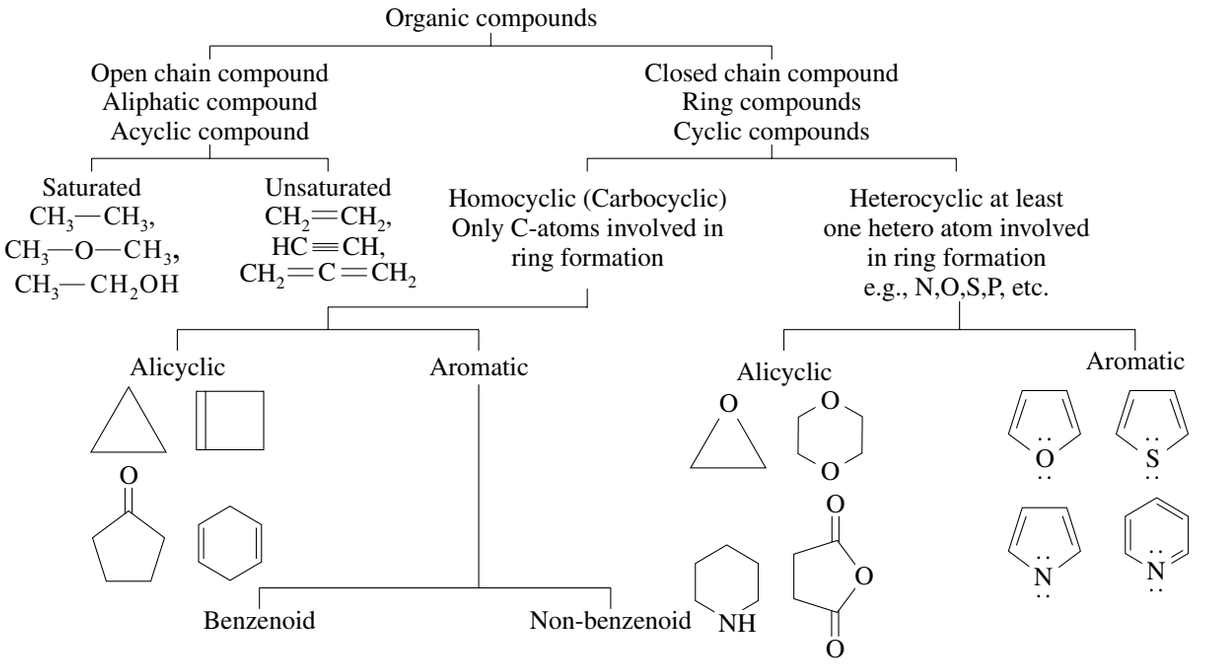
# Classification and Nomenclature

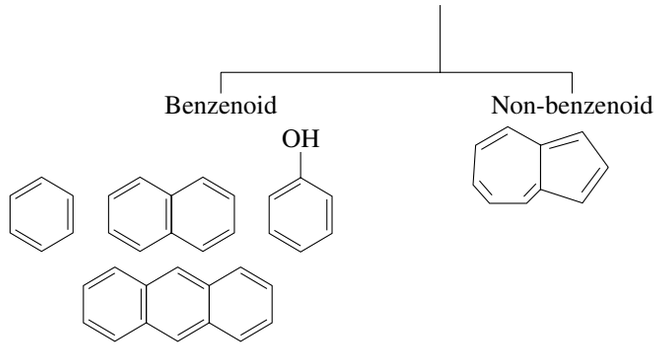
## INTRODUCTION

- Organic substances are mainly found in living organisms like animals and plants.
- The first synthesised organic substance is urea discovered by Whölar.
- Organic substances mainly contain C and H and one or more additional elements like oxygen, nitrogen, sulfur, phosphorous, halogens.
- **Catenation:** The self-linking tendency by covalent bond in non-metals whose co-valency is 2 or more than 2, known as catenation.
- Carbon shows to maximum catenation property.
- Maximum covalency of carbon is 4.
- Carbon atoms join together by single, double or triple bond that gives carbon Skeleton.

## CLASSIFICATION OF ORGANIC COMPOUNDS

All the known organic compounds have been divided in the following manner:






**The four valencies of carbon atom can be represented by the following way:**

| Structure | $\sigma$ bonds | $\pi$ bonds | Hybridisation | Shape | Bond Angle | No. of Bond angles |
|---|---|---|---|---|---|---|
| $-\overset{\vert}{C}-$ | 4 | 0 | $sp^3$ | Tetrahedral (Non planar) | 109°28′ | 6 |
| $-\overset{\vert}{C}=$ | 3 | 1 | $sp^2$ | Planar (Trigonal) | 120° | 3 |
| $-C\equiv$ | 2 | 2 | sp | Linear | 180° | 1 |
| $=C=$ | 2 | 2 | sp | Linear | 180° | 1 |

## Determination of Hybridisation

- It is based upon 'electron pair' (ep) of hybrid atom.

**e.p. = $\sigma$ bond + $\ell$p + (–ve) charge**

| No. of ep. | 2 | 3 | 4 |
|---|---|---|---|
| Hybridisation | sp | $sp^2$ | $Sp^3$ |

## Identification of Carbon

**1.** *Primary, Secondary, Tertiary, and Quaternary carbon*

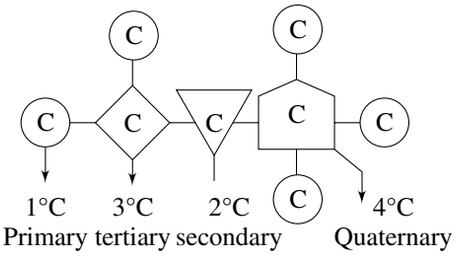
There are four types of carbons in the carbon chain.

(i) **Primary carbon:** A carbon atom attached to one (or no) other carbon atom is termed primary carbon or 1° carbon atom.

(ii) **Secondary carbon:** A carbon atom attached to two other carbon atoms is termed secondary carbon or 2° carbon atom.

(iii) **Tertiary carbon:** A carbon atom attached to three other carbon atoms is termed tertiary carbon or 3° carbon atom.

(iv) **Quaternary carbon:** A carbon atom attached to four other carbon atoms is termed quaternary carbon or 4° carbon atom.



## Identification of Hydrogen

- Nature of H, just same as the nature C through which it is joined

  The hydrogen atoms attached to primary, secondary and tertiary carbon atoms are correspondingly termed as primary, secondary and tertiary hydrogen atoms respectively.

## Type of Structure

1. Normal structure – prefix "n" is used for unbranched carbon chain
2. Iso structure – prefix "iso" is used when one methyl group is attached on $2^{nd}$ carbon from either terminal.
3. Neo structure – prefix "neo" is used when two methyl group is attached on $2^{nd}$ carbon from either terminal.

## Homologous Series

Series of such compounds in which the various members have similar structural features and similar chemical properties but the successive members differ in their molecular formula by $CH_2$ known as homologous series.

## General Characterstics

(i) All compounds in the series composed of some element
(ii) All compounds have same general formula.
(iii) Molor mars of adjacent member differ by 14.
(iv) All compounds in the series have similar chemical properties however different physical properties.

## Naming of Organic Substance

(1) Common name or Trivial name
(2) Derived name
(3) I.U.P.A.C Name and Jeneva Names system

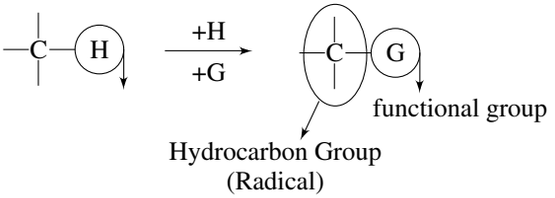
**[1] Common name or Trivial name system**

**Type 1** *Common name based on source:*

- This type of nomenclature is based on their source of origin known as trivial name.

| Substance | Source of origin | Trivial Name |
|---|---|---|
| $CH_4$ | Marsh places | Marsh gas |
| $CH_3–OH$ | Destructive Distillation of wood | Wood spirit |
| $H–\underset{\underset{O}{\|}}{C}–OH$ | Red ant (Formica) | Formic acid |
| $CH_3—COOH$ | Acetum (Vinegar) | Vinegar |
| $CH_3—CH_2—CH_2—COOH$ | Butter | Butyric acid |
| $NH_2–\underset{\underset{O}{\|}}{C}–NH_2$ | Urine | Urea (Carbamide) |
| $CH_3–\underset{\underset{OH}{\|}}{CH}–COOH$ | Lactum (Milk) | Lactic acid |

**Type 2** *Common name radicals*

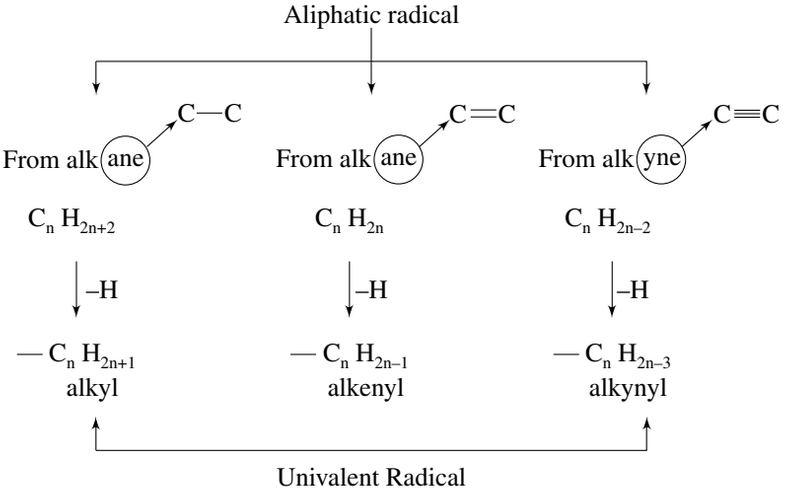


**Radical (– R)**

- It is framework of only C and H
- It is formed by the removal of at least one H from hydrocarbon
- It influences physical property of substance.

## Type of Radical

(1) **Aliphatic Radical:** Those radical which are formed by aliphatic hydrocarbon.




**1. Alkyl Radical**

- Common name = Alk + yl

| Alk | meth | eth | prop | but | pent | hex | hept | oct | non | dec |
|---|---|---|---|---|---|---|---|---|---|---|
| No of carbon | 1C | 2C | 3C | 4C | 5C | 6C | 7C | 8C | 9C | 10C |

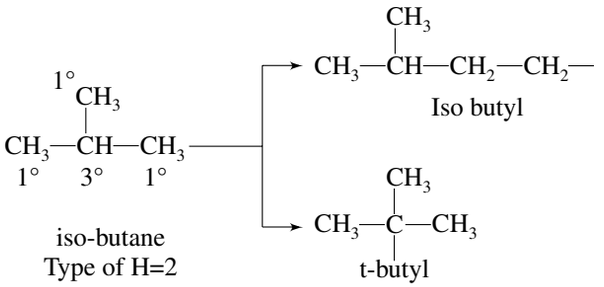
(i) $CH_4 \xrightarrow{-H} —CH_3$
Methane — Methyl (me)

(ii) $CH_3—CH_3 \xrightarrow{-H} CH_3—CH_2—$
ethane — ethyl (et)

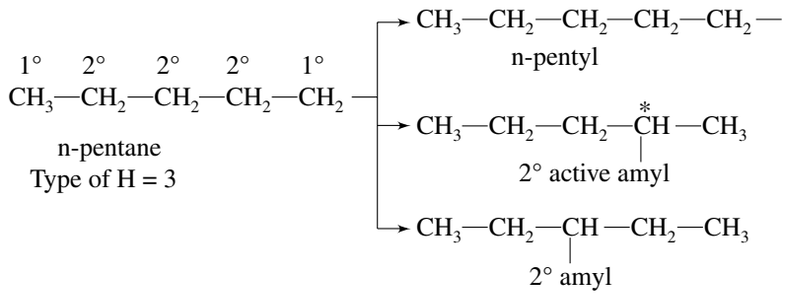
(iii) $CH_3—CH_2—CH_3$
1° 2° 1°
2° Prop ane 2°
Type of H = 2
→ $CH_3—CH_2—CH_2—$ n-propyl
→ $CH_3—CH(—CH_3)—$ Iso-propyl

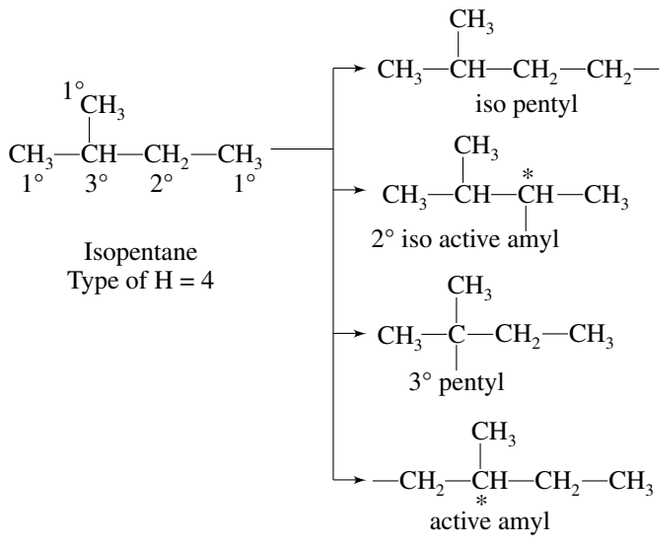
(iv) $C_4H_{10} \xrightarrow{-H} —C_4H_9$
butane — butyl = 4

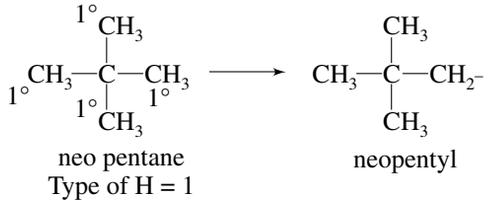
1° 2° 2° 1°
$CH_3—CH_2—CH_2—CH_3$
n-butane
Type of H = 2
→ $CH_3—CH_2—CH_2—CH_2—$ n-butyl
→ $CH_3—CH(—CH_2—CH_3)—$ s-butyl




(v) $C_5H_{12} \xrightarrow{-H} -C_5H_{11}$
Pentane Pentyl (8)



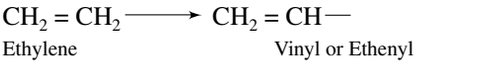



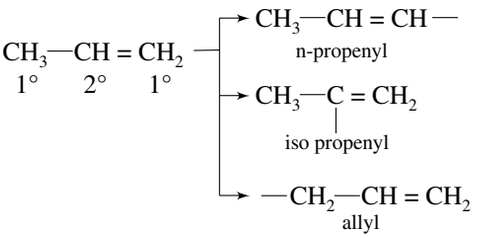



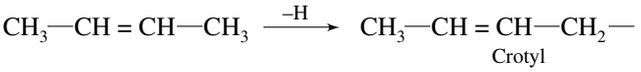

**Note:** Chiral C(*) containing 5C alkyl always named as active amyl

**2. Alkenyl Radical**

Common name = alk + en + yl

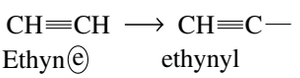


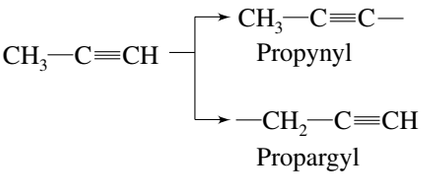




**3. Alkynyl Radical**

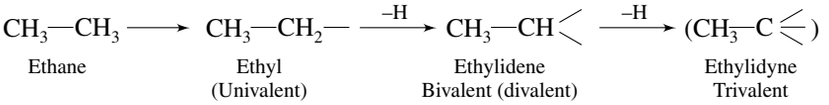
Common name = alk + yn + yl



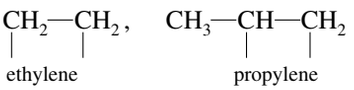




**• Polyvalent Radical**

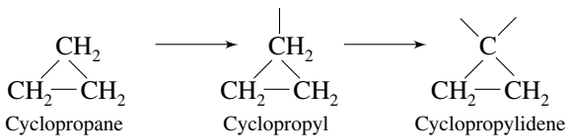
**Case-I:** Removal of more than one H from same carbon.



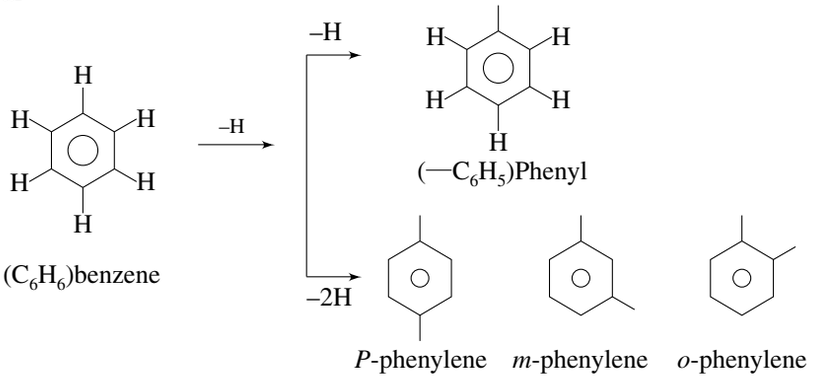

**Case-II:** Removal of more than one H from adjacent carbon.

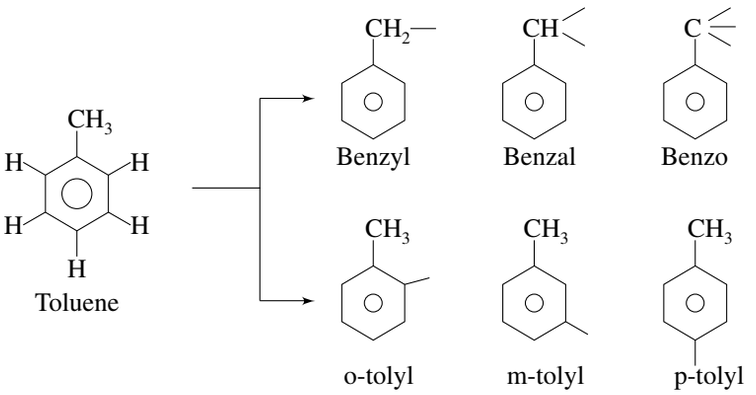



**(2) Alicyclic Radical**




**(3) Aromatic Radical**






**Type 3** *Common name of alkane:*

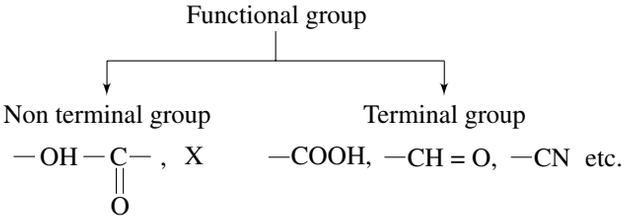
- It is given by using prefix n, iso, neo.

**Type 4** *Common name of alkene:*

- Common name = Alkylene

- In more than 3 carbon containing alkene
  (i) For straight chain-prefix $\alpha$, $\beta$, $\gamma$, $\delta$, etc. is used to locate the position of double bond at 1, 2, 3, 4. carbon, respectively from nearest terminal.
  (ii) For branched alkene- iso, neo prefix used but only when double bond at terminal carbon.

**Type 5** *Common name for functional group containing substance.*




**Case-I:** Substance containing non terminal functional group

- Common name → Name of radical + Name of functional group.

| S.No. | Functional group | Group name |
|---|---|---|
| 1 | $-SO_3H$ | Sulphonic acid |
| 2 | –X (–F, –Cl, Br, –I) | halide |
| 3 | –OH | alcohol |
| 4 | –SH | thio alcohol |
| 5 | –O– | ether |
| 6 | –S– | thio ether |
| 7 | —C— <br> O | ketone |
| 8 | —$NH_2$—NH—, —N— <br> \| | amine |

- In polyvalent group, more than one radical present.
  (i) More than one same radical, expressed by numerical prefix
  2 – di, 3 – tri, 4 – tetra, etc.
  (ii) Different radical always write in alphabet manner.

**Case-II:** Substance containing terminal functional group

- Common name = prefix + suffix

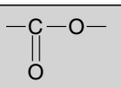
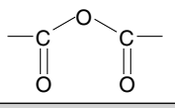
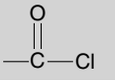
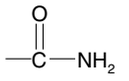
  Prefix–It is based on of total number of carbon present

| Number of carbon | 1C | 2C | 3C | 4C | 5C |
|---|---|---|---|---|---|
| Prefix | Form | Acet | propion | Butyr | Valer |

## Special Prefix

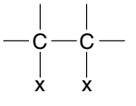
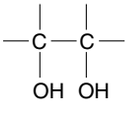
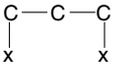
| $C=C-C_{fn}$ | $C-C=C-C_{fn}$ | $Ph-C=C-C_{fn}$ | $CH_3-CO-Cgr$ |
|---|---|---|---|
| Acryl | Croton | Cinnam | Pyruv |

Suffix → It is based on of terminal functional group.

| S.No. | Terminal functional group | Suffix |
|---|---|---|
| 1. | —COOH | ic Acid |
| 2. |  | ate |
| 3. |  | ic anhydride |
| 4. |  | yl chloride |
| 5. |  | Amide |
| 6. | —CH=O | Aldehyde |
| 7. | —C≡N | O-nitrile/Cyanide |
| 8. | —N≡C | O-isonitrile/isocyanide |

**Note:** –CN and –NC are considered in both systems (Case I & Case II)

**Type 6** *Geminal/vicinal/ α-ω type substance*

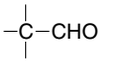
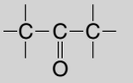
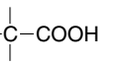
| Geminal compound | Vicinal compound | α-ω type compound |
|---|---|---|
|  Gem dihalide |  vicinal dihalide  vicinal dialohol Glycol |  α-ω type |
| Common name<br>Alkylidene + functional group | Common name<br>alkylene + functional group | Common name<br>poly methylene + functional group |

**Note:** Poly word expressed number of $CH_2$–groups.

| No of $CH_2$– | 3 | 4 | 5 |
|---|---|---|---|
| Poly | Tri | Tetra | Penta |

**[2] Derived name system:**

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

| Series | Name of Homologous series | Name of Representative compound | Structure of group |
|---|---|---|---|
| 1 | Alkane | Methane |  |
| 2 | Alkene | Ethylene | >C=C< |
| 3 | Alkyne | Acetylene | −C≡C− |
| 4 | Alcohol | Carbinol |  |
| 5 | Aldehyde | Acetaldehyde |  |
| 6 | Ketone | Acetone |  |
| 7 | Carboxylic acid | Acetic acid |  |

**[3] IUPAC name system or Geneva name system:**

1. A given compound can be assigned only one name.
2. A given name can clearly direct in writing of one and only one molecular structure.
3. The system can be applied in naming complex organic compounds.
4. The system can be applied in naming multifunctional organic compounds.
5. This is a simple, systematic and scientific method for nomenclature of organic compound.

**IUPAC Nomenclature of Aliphatic Compounds:**

The name of an organic compound consists of three parts:

- Word root
- Prefix
- Suffix

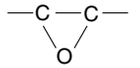
**Word root:** It is given on the basis of number of C in parent chain.

| No of C | 1C | 2C | 3C | 4C | 5C | 6C | 7C | 8C | 9C | 10C | 11C | 12C | 20C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Word root | meth | eth | prop | but | pent | hex | hept | oct | non | dec | undec | dodec | Eicos |

**Prefix:** It is given on the basis of the side chain in parent chain

(i) All alkyl radical works as side chain

(ii) Some of the given functional group always behave as side chain

| S.No. | Functional group | Side chain (prefix) |
|---|---|---|
| 1. | –X | Halo |
| 2. | –OR | Alkoxy |
| 3. |  | Epoxy |
| 4. | $-NO_2$ | Nitro |
| 5. | –N=O | Nitroso |
| 6. | –N=N– | Azo |

(iii) Rest functional group (except above) may be work as side chain according to their priority with respect to other functional group.

## Suffix

**Primary suffix:** If is given by the bonding nature between C–C in selected parent chain.

| S.No. | Bonding nature (PC) | 1° Suffx |
|---|---|---|
| 1. | –C–C–<br>(All single bond) | ANE |
| 2. | –C=C–<br>(Al least one) | ENE |
| 3. | –C≡C–<br>(Al least one) | YNE |
| 4. | –C=C–C≡C–<br>(Both (=) bond and (≡) bond | (ENYNE) |

**Secondary suffix:** It is given on the basis of principal functional group present in parent chain.

- 2° Suffx always written after 1° Sufix as follows.

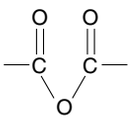
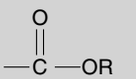
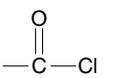
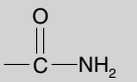
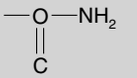
AN E<br>EN E<br>YN E<br>ENYN E) 2° suffix

**Note:** 'e'cancelled only when 1st alphabet of 2° suffix is vowel (a,i,e,o,u)

**Arrangement of prefixes, Root word and Suffixes:**

IUPAC Name = prefix (es) + word root + Primary suffix + Secondary suffix

**Priority table of functional group (selection of Principal functional group)**

| Functional group | Prefix | 2° Suffix |
|---|---|---|
| —COOH | carboxy | Oic Acid |
| —$SO_3H$ | sulpho | Sulphonic Acid |
|  | – | Oic anhydride |
|  | alkoxy carbonyl or carbo alkoxy | Oate |
|  | chloro formyl or Chloro carbonyl | Oyl chloride |
|  | carbamoyl | Amide |
| —C≡N | cyano | Nitrile |
| —N≡C | isocyano | Iso carbonitrile |
| —CH=O | formyl / oxo | AL |
|  | keto or oxo | ONE |
| —OH | hydroxy | OL |
| —SH | mercapto | Thiol |
| —$NH_2$ | amino | Amine |

**Salient features of priority table:**

(1) Above given table shows decreasing priority of functional group.

(2) When only one of above functional group is present in parent chain, then this functional group behave as 2° suffix, known as Principal Functional group.

(3) When more than one of above functional groups is present then higher priority functional group is the principal functional group (2° suffix) and rest are least priority functional groups will be represented by prefix.

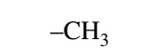
(4) Mostly 2° Suffix C will be included in word root.

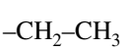
(5) Prefix, C never included in word root except only ketone.

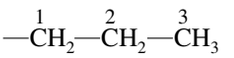
## IUPAC Naming of Side Chain (Radical)

- Numbering always start from free valency containing carbon
- Ending always with 'yl'

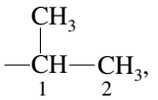
**Simple radicals**

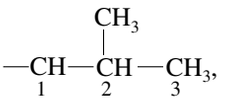

Methyl

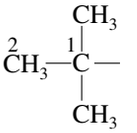

Ethyl

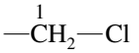

Propyl

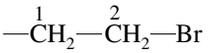
**Complex radicals**

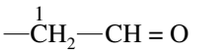

Methyl ethyl (isopropyl)

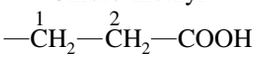

2-Methyl propyl

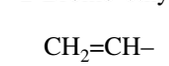

1,1-di methyl ethyl

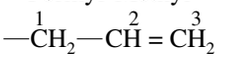

Chloro methyl

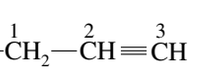

2-Bromo ethyl

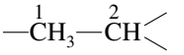

Formyl Methyl

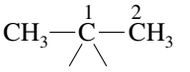

2-Carboxy ethyl


ethenyl (vinyl)


2-propenyl (Allyl)


2-propynyl (propargyl)


Ethylidene


1-Methyl ethylidene

## Important Points

1. Repetition of side chain expressed by numerical prefix 2-di, 3-tri, 4-tetra etc.
2. Repetition of complicated side chain expressed by numerical prefix 2-bis, 3-tris, etc.
3. Different side chain is always written in alphabet manner
4. If alphabet order is same then least locant number side chain written at I$^{st}$ place
5. If di, tri prefix included in complicated side chain then these prefixes include in alphabet comparison.

## Rules of I.U.P.A.C Naming

**Rule 1: Selection of parent chain (PC)**

Parent chain must be contain following in given order of priority:

| Maximum number of Principal functional group | > | Maximum number of multiple bond | > | Maximum number of carbon | > | Maximum number of side chain | > | Lowest set of locant number |
|---|---|---|---|---|---|---|---|---|

**Note:** For open chain substance selection always start and end at terminal carbon.

**Rule 2: Least locant number rule**

Numbering of parent chain start from the terminal that has through which functional group, multiple bond, side chain must have least locant number or lowest set of locant number in given order.

Principal functional group > Multiple bond > side chain

**Rule 3: Alphabet rule**

This rule comes into existence only when least locant number rule does not apply.

When different member of similar category like functional group, multiple bond, side chain are present at equivalent position from either of terminal, then alphabetically preferred member of same category gets least locant number.

## Special Case

1. *Use of some special suffix:*

   When more than two similar terminal functional groups are directly attached with Parent chain or directly attached with ring then according to latest IUPAC convention carbon atom of these functional group is not included in the parent chain even that they work as a Principal functional group (2° suffix)

   • Latest 2° suffix of terminal functional group are given below:

| Functional group | 2° suffix |
|---|---|
| COOH | Carboxylic acid |
| COOR | Carboxylate |
| COCl | Carbonyl chloride |
| $CONH_2$ | Carboxamide |
| C≡N | Carbo nitrile |
| CH=O | Carbaldehyde |

2. *Use of some special prefix:*

   In IUPAC naming O, S, N, Se atom can also be included in parent chain like carbon. The presence of these atom is expressed with special prefix given below with suitable locant no.

| Atom | Prefix |
|---|---|
| O | Oxa |
| S | Thia |
| N | Aza |
| Se | Selena |

**IUPAC Nomenclature of Alicylic Compounds**

(1) Rules 1,2,3 apply as usual like in open chain.
(2) Additional prefix cyclo is used just before word root.
(3) Numbering of cyclic parent chain starts at any C of ring according to rule-2 and 3
(4) We never count number of C of ring and outside ring simultaneously
(5) When both open and closed chain have same feature than closed chain will be selected as a parent chain.

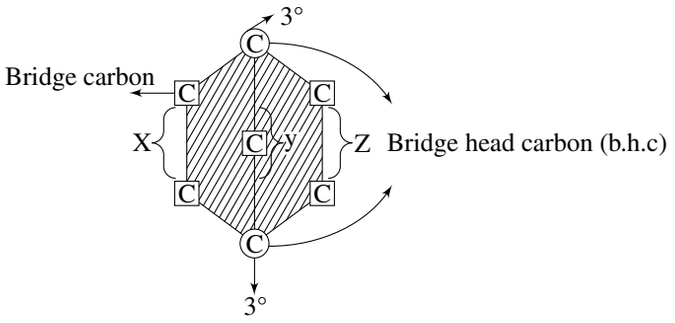
**IUPAC Nomenclature Aromatic Compounds:**

1. The common name of aromatic substance is also recognised as their I.U.P.A.C. name.
2. When benzene ring selected as parent chain

Word root +1° suffix ⇒ Benzene

**IUPAC Nomenclature of Bicyclo Compounds:**

Such cyclic substance two lines are fused together in such a way that they have two common tertiary carbon with ring or one side is common, known as bicyclo substance.




**General rules of naming:**

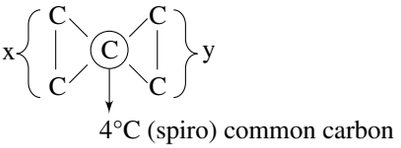
1. Additional prefix bicyclo is used
2. In big bracket write number of bridge carbon of all three direction individually in decreasing order separated by commas.
3. Word root is given on the basis of total number of carbon present in a bicyclic part

| Number of C in bicycle ring = x + y + z + 2 |
|---|

4. Numbering of Bicyclo ring.
   (i) Numbering always starts from one of the b.h.c (Bridge head carbon).
   (ii) It is proceed along higher number of bridge carbon site to next b.h.c.
   (iii) Again proceed along second higher bridge, carbon site.
   (iv) Finally terminate along least bridge carbon site.

**IUPAC Nomenclature of Spiro compounds:**

Such cyclic substance in which two rings are fused together in such a ways that they have only one common carbon, is known as spiro substance.




**General rule of naming:**

1. Additional prefix spiro is used
2. In big bracket write number of carbon of two rings individually except common carbon in increasing order.
3. Word root is given on the basis of total number of carbon present in a spiro ring.

| Number of C in spiro ring = x + y + 1 |
|---|

4. Numbering of spiro ring.
   (i) Numbering always starts from adjacent common carbon in smaller ring.
   (ii) Proceed along smaller ring to spiro carbon.
   (iii) Finally terminate along bigger ring.

## SOLVED EXAMPLE

**1.** Ethyl methyl vinyl amine has the structure–

(1) $CH_3CH_2—\underset{\displaystyle CH_3}{\overset{\displaystyle |}{N}}—CH_2CH=CH_2$

(2) $CH_3CH_2—\underset{\displaystyle CH_3}{\overset{\displaystyle |}{N}}—CH=CH_2$

(3) $CH_2=CH—\underset{\displaystyle CH_3}{\overset{\displaystyle |}{N}}—CH=CH_2$

(4) $CH_3—\underset{\displaystyle CH_3}{\overset{\displaystyle |}{N}}—CH=CH_2$

*Sol.* **[2]**

Ethyl $\rightarrow -C_2H_5$

Methyl $\rightarrow -CH_3$

Vinyl $\rightarrow -CH = CH_2$

3-alkyl containing amine must be 3° amine

$CH_3CH_2—\underset{\displaystyle CH_3}{\overset{\displaystyle |}{N}}—CH=CH_2$

**2.** Derived name of $CH_2=CH–CH_2CO–CH_3$ is

(1) 1-Pentene-1-one (2) Allyl methyl ketone

(3) 4-Pentene-2-one (4) Vinyl acetone

*Sol.* **[4]**

$CH_2= CH—CH_2—\underset{\displaystyle O}{\overset{\displaystyle ||}{C}}—CH_3$

(Sidechain) Vinyl acetone

(representative compound)

**3.** The hybrid state C-atoms which are attached to single bond with each other in the following structure are– $CH_2 = CH—C\equiv CH$

(1) $sp^2$, sp (2) $sp^3$, sp

(3) $sp^2$, $sp^2$ (4) $sp^2$, $sp^3$

*Sol.* **[1]**

$CH_2 = CH—C\equiv CH$

ep=3+0+0 ep=2+0+0

$sp^2$ sp

**4.** The third member of the family of alkenynes has molecular formula-

(1) $C_6H_6$ (2) $C_5H_6$

(3) $C_6H_8$ (4) $C_4H_4$

*Sol.* **[3]**

General formula of alkenyne $\rightarrow C_n H_{2n–4}$

For $1^{st}$ member n = 4

$2^{nd}$ member n = 5

$3^{rd}$ member n = 6

$\because$ Molecular formula = $C_6H_{2\times6–4} = C_6H_8$

**5.** Which of the following is not correctly matched?

(1) Acetonitrile $CH_2 = CHCN$

(2) Allyl chloride $CH_2 = CH – CH_2Cl$

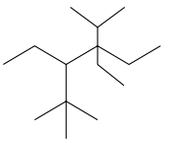
(3) s-Butyl group $CH_3—\underset{\displaystyle |}{CH}—C_2H_5$

(4) Ethylidene chloride $CH_3—CH\begin{matrix}Cl\\Cl\end{matrix}$

*Sol.* **[1]**

Aceto nitrile $\rightarrow CH_3–C \equiv N$ but given $CH_2 = CHCN$ so it is incorrectly matched.

**6.** The correct IUPAC name of the following compound is



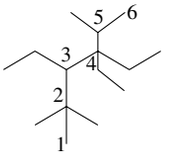
(1) 3-ethtyl-3-isopropyl-4-tertiarybutyl hexane

(2) 3, 3, 4-triethyl-2, 5, 5-trimethyl hexane

(3) 3, 4-diethyl-4-isopropyl-2, 2-dimethyl hexane

(4) 3, 4, 4triethyl-2, 2, 5-trimethyl hexane

*Sol.* **[4]**




Parent chain must be contain maximum number of side chain.

**7.** What is the IUPAC name of the following compound?

$CH_3—C\equiv C—CH_2—\underset{\displaystyle CH_3}{\overset{\displaystyle C\equiv N}{C}}—CH_2—OH$

(1) 2-cyano-2-methyl hex-4-yne--ol

(2) 2-hydroxy methyl-2-methyl-hex-4-yne-nitrile

(3) 2-methyl-2-hydroxy methyl hex-5-yne-nitrile

(4) 1-cyano-2-hydroxymethyl-2-methyl-4-hexyne

*Sol.* **[3]**

$\overset{6}{CH_3}—\overset{5}{C}\equiv\overset{4}{C}—\overset{3}{CH_2}—\underset{\displaystyle CH_3}{\overset{\displaystyle 2}{\overset{\displaystyle C\equiv N}{\overset{\displaystyle 1}{C}}}}—CH_2—OH$

2-methyl-2-hydroxy methyl hex-5-yne-nitrile

Word root = 6C (Hex)

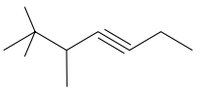
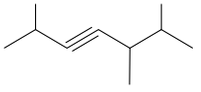
Side chain = $-CH_3$ (methyl) and $-CH_2-OH$ (Hydroxymethyl)

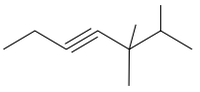
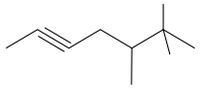
1° suffix → yne

2° suffix → –CN (Nitrile)

Principal functional group must have least locant number.

**8.** Which is the correct structure 5, 6, 6-trimethyl-3-heptyne?

(1)  (2) 

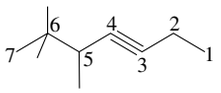
(3)  (4) 

*Sol.* **[1]**

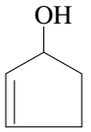
Parent chain must have 7C

1 suffix → yne at 3[ed] C

Three methyl side chain at 5, 6, 6




**9.** The correct IUPAC name of the compound is



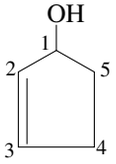

(1) Cyclo pent-1-en-3-ol

(2) Cyclo pent-2-en-1-ol

(3) 3-hydroxy cyclo pentene

(4) None of these

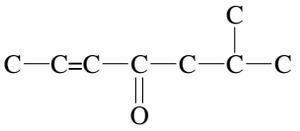
*Sol.* **[2]**




Principal functional group have proirity than multiple bond (rule-2)

Cyclo pent-2-en-1-ol

**10.** The correct IUPAC name of the compound is




(1) 2-methyl hept-5-en-4-one

(2) 6-methyl-4-oxo-2-heptene

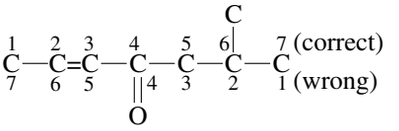
(3) 6-methyl hept-2-en-4-one

(4) None of these

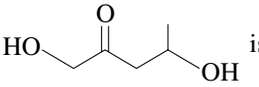
*Sol.* **[3]**

- Numbering of parent chain according to least locant number rule.
- Priority order →

  functional group > Multiple bond > side chain.




6-methyl hept -2-en-4-one

**11.** The IUPAC name of  is–



(1) 3-hydroxybutanoic acid

(2) 4-methyl-2-oxo-1, 4-butanediol

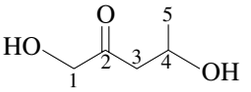
(3) 1, 4-dihydroxy-4-methyl-2-butanone

(4) 1, 4-dihydroxy-2-pentanone

*Sol.* **[4]**

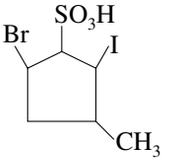
Principal functional group ketone must have least locant number.

–OH group works as side chain.




1, 4-dihydroxy-2-pentanone

**12.** The correct IUPAC name of the compound is




(1) 2-iodo-3-methyl-5-bromocyclo pentane sulphonic acid

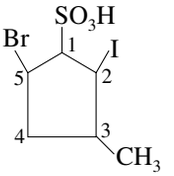
(2) 5-Bromo-4-methyl-5-iodocyclo pentane sulphonic acid

(3) 5-Bromo-3-iodo-2-methylcyclo pentane sulphonic acid

(4) 5-Bromo-2-iodo-3-methylcyclopentane sulphonic acid

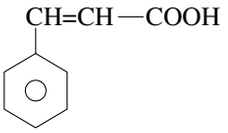
*Sol.* **[4]**

- Cyclic chain selected as parent chain.
- $-SO_3H$ is principal functional group.
- Br, –I, $-CH_3$ are side chain.
- Apply least locant number rule.




5-Bromo-2-iodo-3-methylcyclopentane sulphonic acid

**13.** The correct IUPAC name of the compound is



(1) Cinamic acid

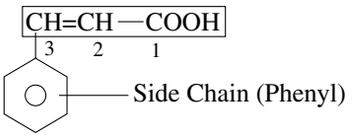
(2) 3-phenyl-2-propenoic acid

(3) $\beta$-phenyl acrylic acid

(4) 1-phenyl-2-propenoic acid

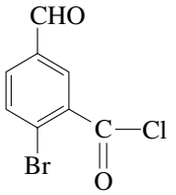
*Sol.* **[2]**

- Open chain contains –COOH group so it is selected as parent chain.




3-phenyl-2-propenoic acid

**14.** The IUPAC name of the following compound is




(1) 4-bromo-3-chlroformyl benzaldehyde

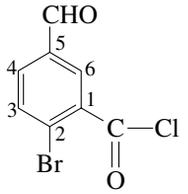
(2) 2-bromo-5-formyl benzene carbochloride

(3) 2-chloro carbonyl bromobenzene

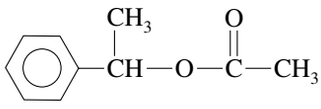
(4) 6-bromo-3-formylbenzo-3-yl chloride

*Sol.* **[2]**

- Benzene ring must be selected as parent chain.
- —C(=O)—Cl group is principal functional group.
- –CH=O, –Br, are side chain.
- Numbering of benzene ring according to least locant number rule.




2-bromo-5-formyl benzene carbochloride

**15.** The IUPAC name of  is

(1) 1-phenyl ethyl ethanoate

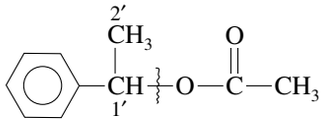
(2) 1-acetoxyethylbenzene

(3) ethoxycyclohexyl ketone

(4) ethyl cyclohexanecarboxylate

*Sol.* **[1]**

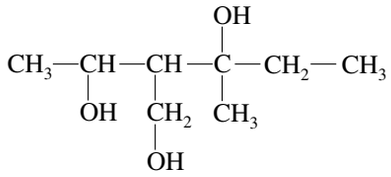
- Principal functional group is ester
- Open chain selected as parent chain.




side chain parent chain

1-phenyl ethyl ethanoate

**16.** The correct IUPAC name of the compound is




(1) 3-hydroxy methyl-4-methyl hexane-2,4-diol

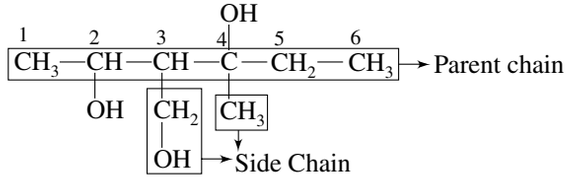
(2) 2-(1-hydroxy ethyl)-4-methyl pentane-1,3-diol

(3) 4-hydroxy methyl-3-methyl hexane-2,4-diol

(4) None of these

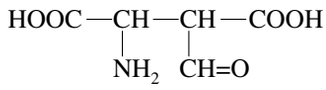
*Sol.* **[1]**

- Parent chain must have maximum number of principal functional group (–OH) with maximum number of carbon.
- Numbering of parent chain according to least locant number rule.




3-hydroxy methyl-4-methyl hexane-2,4-diol

**17.** The correct IUPAC name of the compound is



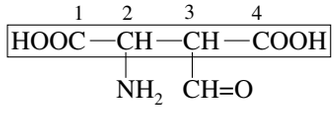

(1) 3-amino-2-formyl butane-1, 4-dioic acid

(2) 3-amino-2, 3-dicarboxy propanal

(3) 2-amino-3-formyl butane-1, 4-dioic acid

(4) 1-amino-2-formyl succinic acid

*Sol.* **[3]**

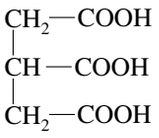



alphabet rule $NH_2$—amine

Although CHO group is before $NH_2$ but after deciding top most in order group (COOH) next groups are arranged alphabetically. So numbering is done from left to right.

Prefix for $NH_2$– group is amino and for CHO– group is formyl.

**18.** The correct IUPAC name of the compound is



(1) 1, 2, 3-tricarboxy-propane

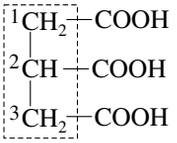
(2) 3-carboxy-1, 5-pentane dioic acid

(3) propane-1, 2, 3-tri carboxylic acid

(4) none of these

*Sol.* **[3]**

When more than two terminal functional groups are directly attached with parent chain then no such group carbon included in word root; according to the latest IUPAC convention 2° suffix is carboxylic acid (–COOH)

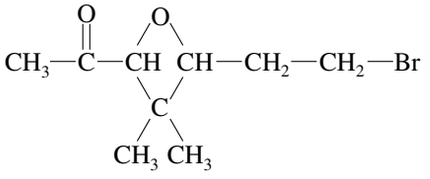


Propane-1, 2, 3-tri carboxylic acid (1st Choice)

3-carboxy-1, 5-pentane dioic acid (2nd Choice)

1, 2, 3-tricarboxy-propane (3rd Choice)

**19.** The correct IUPAC name of the compound is



(1) 7-bromo-3, 5-epoxy-4,4-dimethyl-2-heptanone

(2) 7-bromo-3, 5-epoxy-4, 4-dimethyl-2-oxo heptane

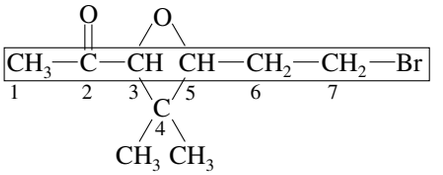
(3) 1-bromo-3, 5-epoxy-4,4-dimethyl-6-heptanone

(4) 1-bromo-4, 4-dimethyl-5-oxo-heptane

*Sol.* **[1]**

- Numbering of parent chain according to the least locant number rule.
- Priority order →

  functional group > Multiple bond > side chain.



7-bromo-3, 5-epoxy-4,4-dimethyl-2-heptanone

**20.** The correct IUPAC name of the compound is $CH_3$–NH–CH=O

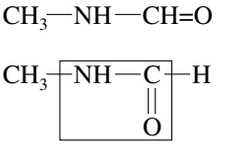
(1) N-formyl methanamine

(2) N-methyl methanamide

(3) Methylanino methanal

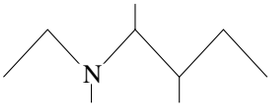
(4) N-methy–N–formyl amino methane

*Sol.* **[2]**



- Principal functional group is amide (–CONH–)

**21.** The correct IUPAC name of the compound is



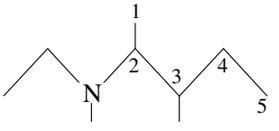
(1) N-Ethyl-N, 3-dimethyl-2-amino pentane

(2) N-ethyl-N, 3-dimethyl-2-pentanamine

(3) N-Ethyl-N, 3-Dimethyl-4-pentanamine

(4) 2-(Ethylmethyamino)-3-methyl pentane

*Sol.* **[2]**



N-ethyl-N, 3-dimethyl-2-pentanamine

**22.** A compound named 5-(1-cyanoethy)-2-methyl hexanoic acid has something wrong according to IUPAC. What is its correct IUPAC name?

(1) 5-ethyl cyanide-2-methyl hexanoic acid

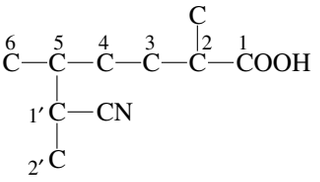
(2) 6-cyano-2, 5-dimethyl heptanoic acid

(3) 6-cyano-5-methyl-2-heptanoic acid

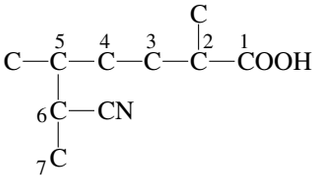
(4) 6-carboxy-2, 3-dimethyl heptanenitrile

*Sol.* **[2]**

- Parent chain must have 6C with COOH group.
- Side chain  and $—CH_3$
- So that possible structure is

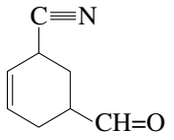


• Correct numbering of parent chain is



6-cyano-2, 5-dimethyl heptanoic acid

**23.** The correct IUPAC name of the compound is

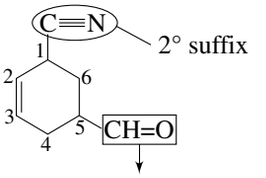


5-formyl cyclo hex-2-en-carbonitrile

(1) 3-cyano cyclo hex-5-en-carbaldehyde
(2) 5-cyano cyclo hex-3-en-carbaldehyde
(3) 5-formyl cyclo hex-2-en-carbonitrile
(4) 3-formyl cyclo hex-5-en-carbonitrile

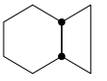
*Sol.* **[3]**

• Numbering of parent chain according to least locant number rule.
• Priority order →
functional group > Multiple bond > side chain.



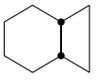
5-formyl cyclo hex-2-en-carbonitrile

**24.** The correct IUPAC name of the compound is



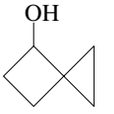
(1) Bicyclo [4, 2, 0] octane
(2) Bicyclo [2, 4, 0] octane
(3) Bicyclo [4, 2, 0] hexane
(4) None of these

*Sol.* **[1]**



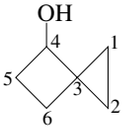
Bicyclo [4, 2, 0] octane

**25.** The correct IUPAC name of the compound is



(1) Spiro [3,2] hexan-4-ol
(2) Spiro [2,3] hexan-2-ol
(3) Spiro [2,3] hexan-4-ol
(4) Spiro [3,2] hexan-2-ol

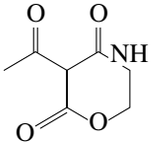
*Sol.* **[3]**



Spiro [2,3] hexan-4-ol

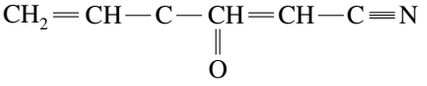
## EXERCISE 1

**1.** Identify which functional group is **Not** present in the following compound?



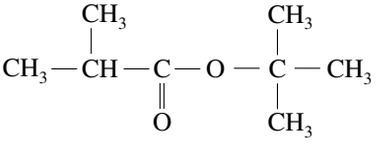
(1) Ketone (2) Ester
(3) Amide (4) Ether

**2.** The number of olefinic bonds in the given compound is–

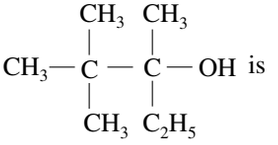


(1) 2 (2) 3
(3) 1 (4) 4

**3.** The common name of given ester is–

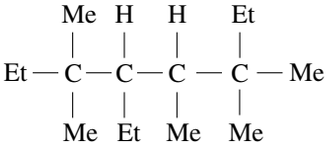


(1) Neo butyl isobutyrate (2) t-Butyl n-butyrate
(3) t-Butyl isobutyrate (4) Iso butyl isobutyrate

**4.** The derived name of  is

(1) t-Butyl ethyl methyl carbinol
(2) t-Butyl ethyl methyl methanol
(3) t-Butyl methyl ethyl carbinol
(4) t-Butyl methyl ethyl methanol

**5.** Numbers of 3° carbon and 2° hydrogen respectively in the following structure are:

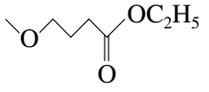


(1) 3, 6 (2) 2, 4
(3) 2, 6 (4) 1, 6

**6.** Which is true regarding cinnamaldehyde?
(1) All carbon have same hybridisation
(2) It is non-polar
(3) IUPAC name is phenyl propenal
(4) It is an aromatic aldehyde

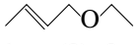
**7.** Give the IUPAC name of an alkane with the formula $C_8H_{18}$ that has only primary hydrogen atom
(1) 2, 2, 4, 4-tetra methyl butane
(2) 2, 2, 3, 3-tetra methyl butane
(3) 2, 3-dimethyl hexane
(4) octane

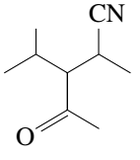
**8.** The IUPAC name of the following compound is:



(1) 3-methoxy ethylpropanoate
(2) ethyl4-methoxybutanoate
(3) 1,4-diethoxybutane
(4) 4-methoxy-ethylbutanoate

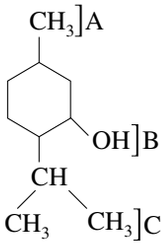
**9.** The correct decreasing order of priority for the functional groups of organic compounds in the IUPAC system of nomenclature is
(1) $-SO_3H$, –COCl, $-CONH_2$, –CHO
(2) –CHO, –COCl, $-SO_3H$, $-CONH_2$
(3) $-CONH_2$, –CHO, $-SO_3H$, –COCl
(4) –COCl, $-SO_3H$, $-CONH_2$, –CHO

**10.** The IUPAC name of  is
(1) 2-butenyl ethyl ether (2) 3-ethoxy-2-butene
(3) 3-oxa-5-heptene (4) 1-ethoxy-2-butene

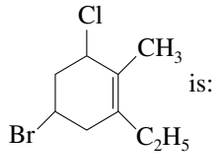
**11.** The IUPAC name of  is

(1) 2-methyl-3-(1-methylethyl)-4-oxopentanenitrile
(2) 4-cyano-3-(1-methylethyl)-2-pentanone
(3) 3-Acetyl-2-cyano-4 -methylpentane
(4) 3-ethanoyl-2-methyl-3-(1-methylethyl) pentane nitrile

**12.** In the following compound, group designated as A, B, C will be numbered as:

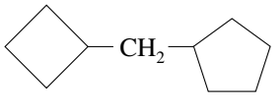
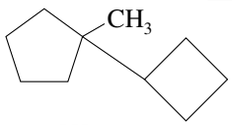
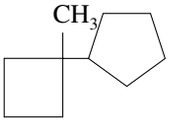
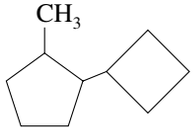


(1) 1, 2, 4 (2) 4, 2, 1
(3) 5, 1, 2 (4) 3, 1, 6

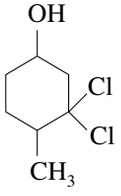
**13.** IUPAC Name of  is:

(1) 4-Bromo-6-chloro-2-ethyl-1-methylcyclohex-1-ene
(2) 5-Bromo-1-chloro-3-ethyl-2-methylcyclohex-2-ene
(3) 5-Bromo-3-chloro-1-ethyl-2-methylcyclohex-1-ene
(4) 1-Bromo-5-chloro-3-ethyl-4-methylcyclohex-3-ene

**14.** The correct structure of cyclobutylmethyl cyclopentane is

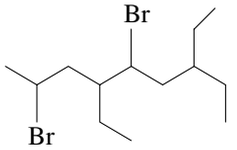
(1) 
(2) 
(3) 
(4) 

**15.** What is IUPAC name of the compound shown below?



(1) 3, 3-dichloro-4-methyl cyclohexanol
(2) 1, 1-dichloro-6-methyl-3-cyclohexanol
(3) 1, 1-dichloro-2-methyl-5-cyclohexanol
(4) 2, 2-dichloro-1-methyl-4-cyclohexanol

**16.** The systematic name of the given structure is



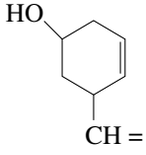

(1) 2, 5-dibromo-4, 7-diethyl octane
(2) 4, 7-dibromo-2, 5-diethyl octane
(3) 5, 8-dibromo-6-methyl-3-methyl nonane
(4) 2, 5-dibromo-4-ethyl-7-methyl nonane

**17.** One of the names given below violates an important IUPAC convention. Which is that name?
(1) 2-cyclopropyl-2-methyl propane
(2) 2-bromo-4-chlorobutane
(3) Ethyl pentane
(4) 3-bromo-1, 1-dichlorocyclohexane

**18.** A hydrocarbon X has molar mass 84 but contains no double or triple bonds. Also X has no methyl locant. How many different IUPAC name can be assigned to X?
(1) 2 (2) 3
(3) 4 (4) 6

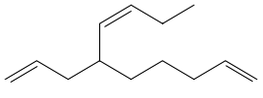
**19.** Which of the following is an incorrect name according to the IUPAC?
(1) 2-cyclopropyl butane
(2) 1-bromo-2, 2-dichloro cyclobutane
(3) Cyclohexyl cyclohexane
(4) 1-cyclobutyl cyclobutane

**20.** What is the correct IUPAC name of the compound?



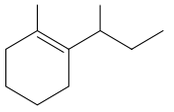

(1) 3-hydroxy cyclo hex-2-ene-1-carbaldehyde
(2) 5-hydroxy cyclo hex-2-ene-1-al
(3) 3-formyl-Cyclo hex-4-ene-1-ol
(4) 5-hydroxy cyclo hex-2-ene-carbaldehyde

**21.** What is the correct IUPAC name of the following compound?



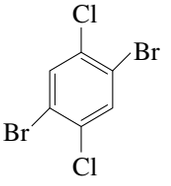
(1) 4-(1-propenyl)-1, 8-nonadiene
(2) 5-(2-propenyl)-3, 9-decadiene
(3) 6-(2-propenyl)-1, 7-decadiene
(4) 4-(1-butenyl)-1, 8-nonadiene

**22.** IUPAC name of the given compound is



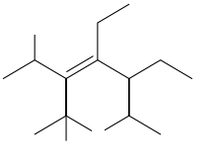
(1) 2-methyl-1-(1′-methyl propyl) cyclohexene
(2) 1-(1′-methyl propyl)-2-methyl cyclohexene
(3) 2-Methyl-1-(1′-methyl ethyl) cyclohexene
(4) None of these

**23.** What is the correct IUPAC name of the following compound?



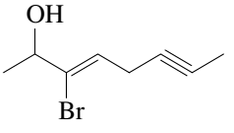

(1) 2, 5-dibromo-1-4-dichlorobenzene
(2) 1, 4-dibromo-3, 5-dichlorobenzene
(3) 3, 5-dibromo-1, 4-dichlorobenzene
(4) 1, 4-dibromo-2, 5-dichlorobenzene

**24.** The IUPAC name of the structure



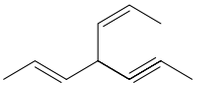
is
(1) 3-t-butyl-4-ethyl-5-isopropyl-2-methyl-3-heptene
(2) 4, 5-diethyl-2, 2, 6-trimethyl-3-(1-methylethyl)-3-heptene
(3) 3-(1, 1-dimethyl ethyl)-4, 5-diethyl-2, 6-dimethyl-3-heptene
(4) 4-ethyl-2, 2-dimethyl-3, 5-bis (1-methylethyl)-3-heptene

**25.** What is the correct IUPAC name of the compound shown below?



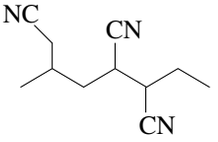

(1) 3-bromo-3-octen-5-yne-2-ol
(2) 3-bromo-3-octen-6-yne-2-ol
(3) 6-bromo-5-octen-2-yne-7-ol
(4) None of these

**26.** What is correct IUPAC name of the following compound?



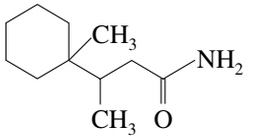
(1) 4-(2-propynyl)-hepta-2, 5-diene
(2) 4-(1′-propynyl) hepta-2, 5-diene
(3) 4-(1-propenyl)-2-heptene-5-yne
(4) 4-(1-propenyl)-5-heptene-2-yne

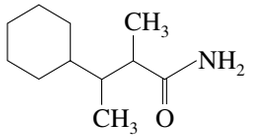
**27.** What is the correct IUPAC name of the compound?

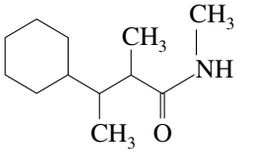


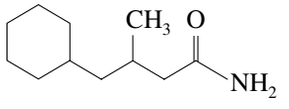
(1) 3-cyano-2, 5-dimethyl heptanedinitrile
(2) 5-cyano-3, 6-dimethyl heptanedinitrile
(3) 2, 5-dimethyl-1, 3, 7-heptanedinitrile
(4) 2-methyl hexane-1, 4, 5 tricarbonitrile

**28.** Which is the correct structure of 3-cyclohexylmethyl butanamide?

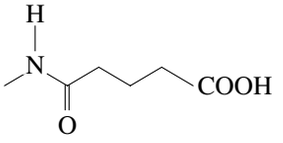
(1) 

(2) 

(3) 

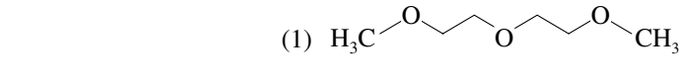
(4) 

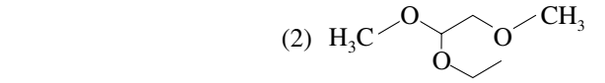
**29.** What is the correct IUPAC name of the following compound?

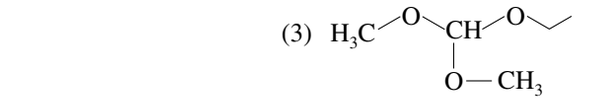


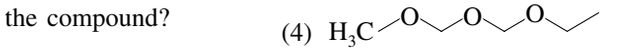
(1) 3-(N-methyl amino) carbonyl propanoic acid
(2) 3-carboxy (N-methyl) propanamide
(3) 4-(N-methyl amino)-4-oxobutanoic acid
(4) 3-(N-methyl carbamoyl) propanoic acid

**30.** Which is the correct structure of compound 1-methoxy-2-(2-methoxy ethoxy) ethane?

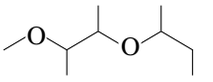
(1) 

(2) 

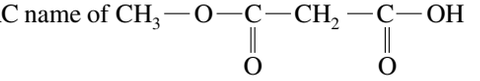
(3) 

(4) 

**31.** What is the correct IUPAC name of

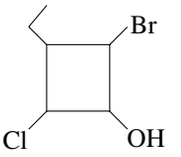


(1) 2-methoxy-3-(methyl propoxy) butane
(2) 2, 3-dioxy-2, 4-dimethyl butane
(3) 3, 4, 6-trimethyl-2, 5-dioxa octane
(4) both (1) and (3)

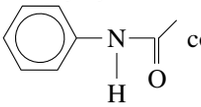
**32.** The IUPAC name of  is:

(1) 2-carbomethoxy ethanoic acid
(2) 2-Acetoxy ethanoic acid
(3) 2-Ethanoyloxy acetic acid
(4) 2-Ethanoyloxyethanoic acid

**33.** Correct IUPAC name of the given compound is:

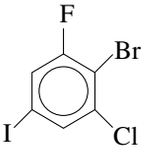


(1) 2-bromo-3-ethyl-4-chlorocyclobutanol
(2) 4-bromo-1-chloro-3-ethylcyclobutanol
(3) 3-bromo-4-chloro-3-ethyl cyclohydroxybutane
(4) 2-bromo-4-chloro-3-ethylcyclobutanol

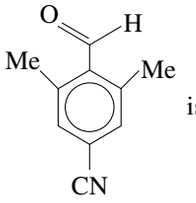
**34.** The IUPAC name of  compound is

(1) N-phenylaminoethanone
(2) N-phenylethanamide
(3) N-phenylmethanamide
(4) N-phenylaminomethane

**35.** The correct IUPAC name of

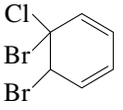


(1) 1-bromo-2-chloro-6-fluoro-4-iodobenzene
(2) 1-bromo-6-chloro-2-fluoro-4-iodobenzene
(3) 2-bromo-1-chloro-3-fluoro-5-iodobenzene
(4) 2-bromo-3-chloro-1-fluoro-5-iodobenzene

**36.** IUPAC Name of  is:

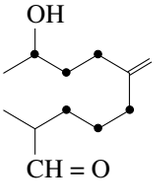

(1) 4-oxo-2, 6-dimethyl benzene carbonitrile
(2) 4-Cyano-2, 6-dimethyl benzaldehyde
(3) 4-formyl 3,5-dimethyl benzonitrile
(4) None of these

**37.** What is correct IUPAC name of the compound shown below?



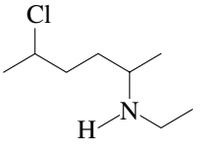

(1) 5, 6-dibromo-6-chloro-1, 3-cyclohexadiene
(2) 2, 3-dibromo-2-chloro-1, 4-cyclohexadiene
(3) 1, 2-dibromo-1-chloro-3, 5-cyclohexadiene
(4) 5, 6-dibromo-5-chloro-1, 3-cyclohexadiene

**38.** Write the IUPAC name given



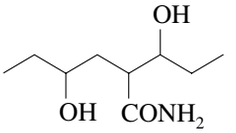

(1) 2-methyl-1-(3′-hydroxy butyl)-6-heptenal
(2) 9-hydroxy-2-methyl-5-decene
(3) 1-(3′-hydroxy butyl)-2-methyl- 6-heptenal
(4) None of these

**39.** What is the correct IUPAC name of the compound?




(1) 4-chloro-N-ethyl-1-methyl-1-pentanamine
(2) 5-chloro-N-ethyl-2-hexanamine
(3) 5-chloro-N-ethyl-1-hexanamine
(4) 2-chloro-N-ethyl-5-hexanamine

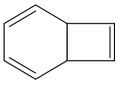
**40.** What is the correct IUPAC name of the compound shown below?




(1) 3, 6-dihydroxy-4-octanamide
(2) 3, 6-dihydroxy-5-octanenamide
(3) 4-hydroxy-2-(1-hydroxy propyl) hexanamide
(4) 3-hydroxy-2-(2-hydroxy butyl) pentanamide

## EXERCISE 2

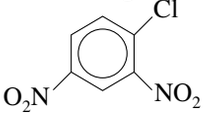
**1.** The number of $sp^2$–$sp^2$ sigma bonds in the compound given molecule below is:



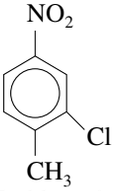
(1) 1 (2) 3
(3) 4 (4) 5

**2.** In compound $HC\equiv C–CH_2–$ $CH=CH–CH_3$ the $C_2–C_3$ bond is the type of–
(1) sp–$sp^2$ (2) $sp^3$–$sp^3$
(3) sp–$sp^3$ (4) $sp^2$–$sp^2$

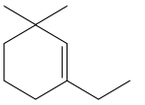
**3.** Which of the following is correctly named?

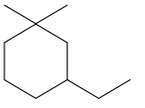
(1) 

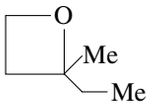
4-Chloro-1,3-dinitro benzene

(2) 

4-Methyl-5-chloronitro benzene

(3) 
1-Ethyl-3,3-dimethyl cyclohexene

(4) 
1-Ethyl-3,3-dimethyl cyclohexene

**4.** IUPAC name of  is:

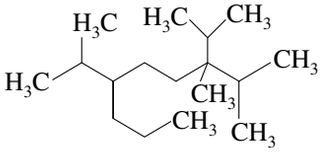
(1) 2-Ethyl-3-methyl epoxy butane

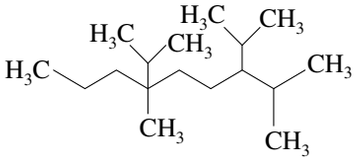
(2) 4-Ethyl-4-methyl oxetane

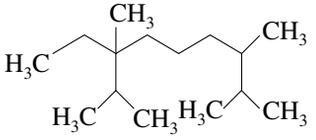
(3) 2-Ethyl-2-methyl oxetane

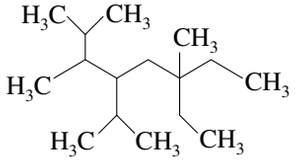
(4) 2-methyl-2-ethyl oxetane

**5.** The correct structure of compound 3, 6-diisopropyl-2,6-dimethyl nonane is

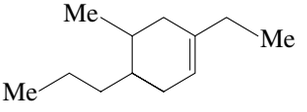
(1) 

(2) 

(3) 

(4) 

**6.** According to IUPAC convention, what is the name to the compound given below?



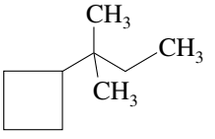
(1) 1-ethyl-5-methyl-4-propyl cyclohexene

(2) 2-ethyl-4-methyl-5-propyl cyclohexene

(3) 5-ethyl-1-methyl-2-propyl-4-cyclohexene

(4) 4-ethyl-2-methyl-1-propyl-4-cyclohexene

**7.** According to IUPAC convention, the correct name of the following compounds is



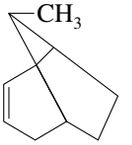
(1) 1-(1, 1-dimethylpropyl) cyclobutane

(2) 1-cyclobutyl-1, 1-dimethyl propane

(3) 2-cyclobutyl-2-methyl butane

(4) 1-(1-methylbutyl) cyclobutane

**8.** What is the systematic IUPAC name of the following compound?



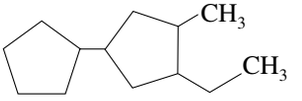
(1) 8-methyl bicyclo [3, 2, 1] oct-3-ene

(2) 8-methyl bicyclo [3, 2, 1] oct-2-ene

(3) 6-methyl bicyclo [3, 2, 1] oct-2- ene

(4) 6-methyl bicyclo [1, 2, 3] oct-2-ene

**9.** According to IUPAC convention, name of the following compound is



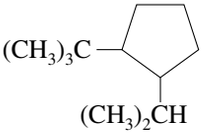
(1) 2-ethyl-4-methyl-1-cyclopentyl cyclopentane

(2) 2-ethyl-1-methyl-4-cyclopentyl cyclopentane

(3) 1-cyclopentyl-3-ethyl-4- methyl cyclopentane

(4) 4-cyclopentyl-1-ethyl-2- methyl cyclopentane

**10.** The correct IUPAC name of given substance is



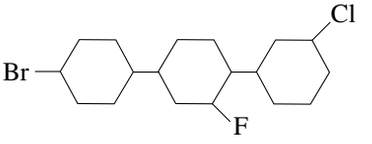
(1) 1-isopropyl-2-ter-butyl cyclopentane

(2) 1-ter-butyl-2-isopropyl cyclopentane

(3) 2-isopropyl-1-ter-butyl cyclopentane

(4) 2-ter-butyl-1-isopropyl cyclopentane

**11.** According to IUPAC convention, the systematic name of the compound given below is



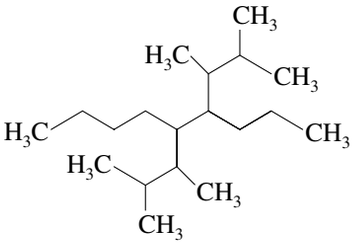
(1) 1-(3-chlorocyclohexyl)-4-(4-bromocyclohexyl)-2-fluorocyclohexane

(2) 5-(4-bromocyclohexyl)-2-(3-chlorocyclohexyl)-1-flouorocyclohexane

(3) 4-(4-bromocyclohexyl)-1-(3-chlorocyclohexyl)-2-fluorocyclohexane

(4) 1-(4-bromocyclohexyl)-4-(3-chlorocyclohexyl)-3-fluorocyclohexane

**12.** What is the correct IUPAC name of the compound shown below?



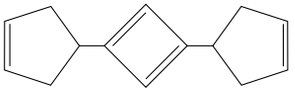
(1) 4-butyl-2, 3 6, 7-tetramethyl-5-propyl octane

(2) 4, 5-bis (1, 2-dimethyl propyl) nonane

(3) 5-(1, 2-dimethy lsopropyl)-2, 3-dimethyl-4-propyl nonane

(4) Both '2' and '3' are correct

**13.** What is the correct IUPAC name of the compound shown below?



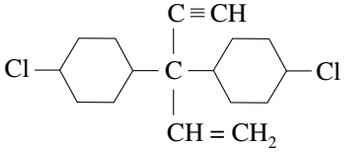
(1) Bis (cyclopentenyl) cyclobutadiene

(2) 1, 3-bis (3-cyclopentenyl) cyclobutadiene

(3) Dicyclopentene cyclobutadiene

(4) 4-[3-(3-cyclopentenyl)-1, 3-cyclobutadienyl] cyclopentene

**14.** What is the correct IUPAC name of the compound shown below?



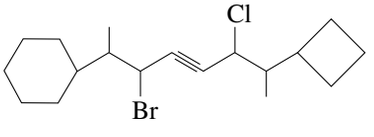
(1) 3, 3-bis-(chlorocyclohexyl) 1-penten-4-yne

(2) bis-(4-chlorocyclohexyl) 4-penten-1-yne

(3) 3, 3-bis-(4-chlorocyclohexyl)-1-penten-4-yne

(4) 3, 3-bis(4-chlorohexyl)-3-ethynyl prop-1-ene

**15.** What is the correct IUPAC name of the compound shown below?



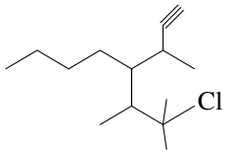
(1) 5-bromo-2-chloro-1-cyclobutyl-6-cyclohexyl-1, 6-dimethyl-3-hexyne

(2) 6-bromo-3-chloro-2-cyclobutyl-7-cyclohexyl-4-octyne

(3) 3-bromo-6-chloro-7-cyclohutyl-2-cyclohexyl-4-octyne

(4) 5-bromo-2-chloro-1-cyclobutyl-6-cyclohexyl-1-methyl-3-heptyne

**16.** What is the correct IUPAC name of the compound shown below?



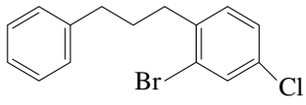
(1) 4-butyl-6-chloro-3, 5, 6-trimethyl-1-heptyne

(2) 4-butyl-6-chloro-3, 5, 6, 6-tetramethyl-1-heptyne

(3) 4-butyl-2-chloro-2, 3, 5-trimethyl-6-heptyne

(4) 4-(2-chloro-1, 2-dimethylpropyl)-3methyl-1-octyne

**17.** What is the correct IUPAC name of the following compound?



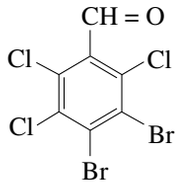
(1) 1-(2-bromo-4-chlorophenyl)-3-phenyl propane

(2) 3-bromo-2-(3-phenylpropyl) chlorobenzene

(3) 1-bromo-5-chloro-2-(3-phenylpropyl) benzene

(4) 2-bromo-4-chloro-1-(3-phenylpropyl) benzene

**18.** What is the correct IUPAC name of the compound given below?



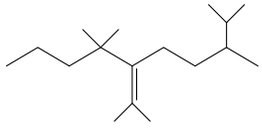
(1) 3, 4-dibromo-2, 5, 6-trichlorobenzaldehyde

(2) 1, 2-dibromo-3, 5, 6-trichlorobenzaldehyde

(3) 4, 5-dibromo-3, 3, 6-trichlorobenzaldehyde

(4) 5, 6-dibromo-1, 2, 4-trichlorobenzaldehyde

**19.** The IUPAC name of the compound shown below is



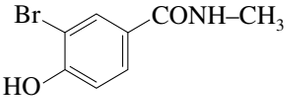
(1) 2, 4,4-timethyl-3-(3,4-dinethyl pentyl) hept-2-ene

(2) 2-isopropyl-6, 6-dimethyl 5-(methyl ethenyl) nonane

(3) 2-(methyl ethyl)-5-isopropylidene-6, 6-dimethyl nonane

(4) 2,6,7-trimethyl-3-(1′, 1′-dimethyl butyl) oct-2-ene

**20.** What is the correct IUPAC name of the compound shown below?



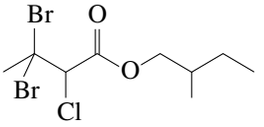

(1) 4-aminocarbonyl-3-bromo N-methyl phenol

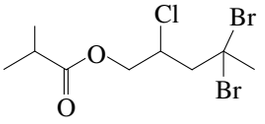
(2) 3-bromo-4-hydroxy N-methyl benzene carboxamide

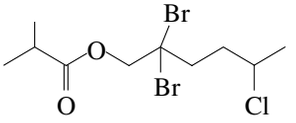
(3) 5-bromo-4-hydroxy N-methylbenzene carboxamide

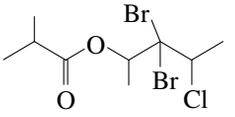
(4) N-methyl 4-amido-3-bromophenol

**21.** Which of the following is correct structure of 3, 3-dibromo-2-chlorobutyl 2-methyl propanoate?

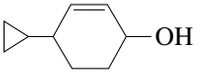
(1) 

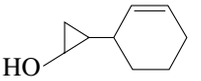

(2) 

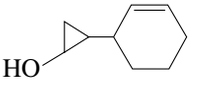

(3) 

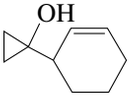

(4) 


**22.** Which is the correct structure of 2-(2-cyclohexenyl) cyclopropanol?

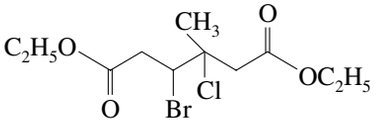
(1) 


(2) 


(3) 


(4) 


**23.** What is the correct IUPAC name of the compound given below?



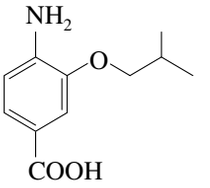

(1) 3-bromo-4-chloro-4-methyl ethyl hexanedioate

(2) Diethyl 4-bromo-3-chloro-3-methyl hexanedioate

(3) Ethyl 4-bromo-3-chloro-3-methyl hexanedioate

(4) Diethyl 3-bromo-4-chloro-4-methyl hexanedioate

**24.** What is IUPAC name of the compound given below?



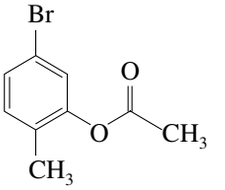

(1) 4-carboxy-2-(2′-methyl propoxy) aniline

(2) 4-amino-5-(2′-methyl propoxy) benzoic acid

(3) 4-amino-3- (2′-methyl propoxy) benzoic acid

(4) 4-amino-3-(2′-methyl propoxy) carboxy benzene

**25.** The correct IUPAC name of the compound given below is



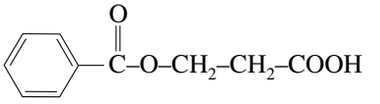

(1) 5-bromo-2-methyl phenyl ethanoate

(2) 3-bromo-6-methyl phenyl ethanoate

(3) 4-bromo-2-{oxy-(1-oxoethyl)} toluene

(4) Methyl 5-bromo-2-methyl benzoate

**26.** What is the correct IUPAC name of the compound shown below?



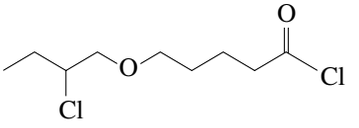

(1) 3-carboxy phenyl propanoic acid

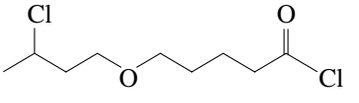
(2) 3-(benzoyloxy) propanoic acid

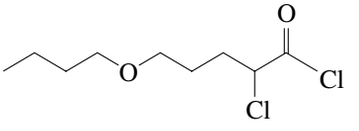
(3) 3-hydroxy-3-oxoethyl benzoate

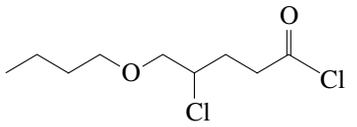
(4) 3-oxyphenyl carboxy propanoic acid

**27.** The correct structure of 5-(2-chlorobutoxy) pentanoyl chloride is

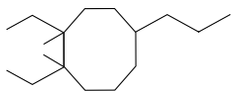
(1) 

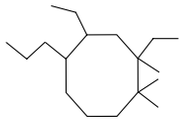

(2) 

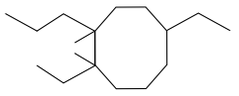

(3) 

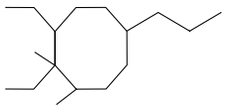
(4) 


**28.** The correct structural formula of 1,2-diethyl-1, 8-dimethyl-5-propyl cyclooctane is

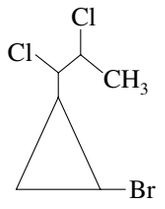
(1) 

(2) 

(3) 

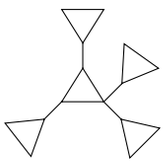
(4) 

**29.** The correct IUPAC name of the compound shown below is



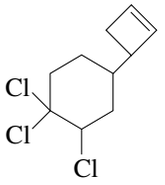

(1) 1-bromo-2-(1, 2-dichloropropyl) cyclopropane
(2) 2-bromo-1-(1, 2-dichloropropyl) cyclopropane
(3) 1-bromocyclopropyl-1, 2-dichloro propane
(4) 1-(2-bromocyclopropyl)-1, 2-dichloropropane

**30.** What is the IUPAC name of the compound shown below?



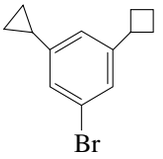
(1) Tetracyclopropyl cyclopropane
(2) Pentacyclopropane
(3) 1, 2, 2, 3-tetracyclopropyl cyclopropane
(4) 1, 1, 2, 3-tetracyclopropyl cyclopropane

**31.** What is the correct IUPAC name of the compound shown below?



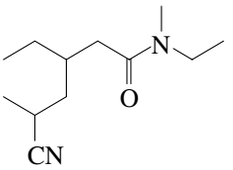

(1) 1, 1, 2-trichloro-4-cyclobutenyl cyclohexane
(2) 3-trichlorocyclohexyl cyclobutene
(3) 3-(3, 4, 4-trichlorocyclohexyl) cyclobutene
(4) 3, 4, 4-trichloro-1-cyclobutenyl cyclohexane

**32.** What is the correct IUPAC name of the compound shown below?



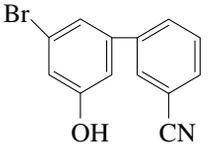

(1) 3-bromo-1-cyclobutyl-5-cyclopropyl benzene
(2) 3-bromo-1-cyclopropyl-5-cyclobutyl benzene
(3) 1-bromo-5-cyclobutyl-3-cyclopropyl benzene
(4) 1-bromo-3-cyclobutyl-5-cyclopropyl benzene

**33.** What is the correct IUPAC name of the following compound?



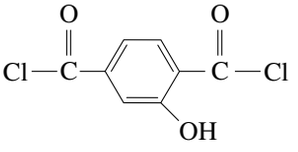

(1) 3-(2-cyanopropyl)-N-ethyl N-methyl pentanamide
(2) N-ethyl-3-(2-cyanopropyl) N-methyl pentanamide
(3) N, 3-diethyl-5-cyano N-methyl hexanamide
(4) 5-cyano-N, 3-diethyl N-methyl hexanamide

**34.** What is the correct IUPAC name of the compound shown below?



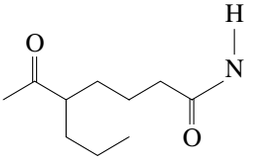

(1) 3-bromo-5-(3′-cyanophenyl) phenol
(2) 5-bromo-3-(3′-cyanophenyl) phenol
(3) 3-(3′-hydroxy-5′-bromophenyl) benzonitrile
(4) 3-(3′-bromo-5′-hydroxy phenyl) benzonitrile

**35.** What is the correct IUPAC name of the given compound?




(1) 2-hydroxy-1, 4-benzene dicarbonyl chloride
(2) 2, 4-dichloro carbonyl phenol
(3) 3-hydroxy-1, 4-benzene dicarbonyl chloride
(4) 1, 4-dicarbonyl chloride-3-hydroxy benzene

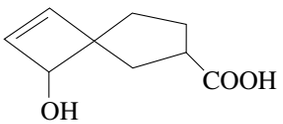
**36.** In the IUPAC name of the following compound, there is something wrong. Find the mistake.




N-ethyl-6-oxo-5 propyl heptanamide

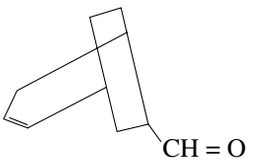
(1) Principal functional group is incorrectly chosen
(2) Incorrect prefix for locant is used
(3) Parent chain is incorrectly selected
(4) Locants name is not written is order of priority recommended by IUPAC

**37.** IUPAC name of the following compound is:



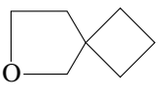

(1) 1-hydroxy spiro [3, 4] oct-2-ene-6-carboxylic acid
(2) 6-carboxy spiro [3, 4] oct-2-ene-1-ol
(3) 3-hydroxy spiro [3,4] oct-1-ene-6-carboxylic acid
(4) 2-carboxy spiro [3,4] oct-7-ene-6-ol

**38.** The IUPAC name of the following compound is:



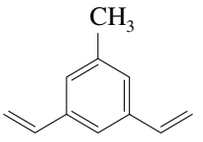

(1) Bicyclo [2,3,2] non-2-ene-6-carbaldehyde
(2) Bicyclo [3,2,2] non-5-ene-2-carbaldehyde
(3) Bicyclo [3,2,2] non-2-ene-6-carbaldehyde
(4) Bicyclo [3,2,0] non-2-ene-6-carbaldehyde

**39.** What is the correct IUPAC name of the compound shown below?




(1) 6-oxa spiro [2,3] octane
(2) 6-oxa spiro [4,3] octane
(3) 6-oxa spiro [3,3] heptane
(4) 6-oxa spiro [3,4] octane

**40.** What is the correct IUPAC name of the following compound?

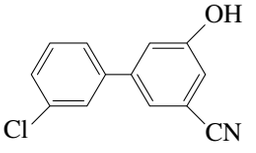



(1) 3, 5-diethenyl toluene
(2) 1, 3-diethenyl-5-methyl benzene
(3) 3-ethenyl-5-methyl styrene
(4) 1, 3, 5-triethenylmethyl benzene

## EXERCISE 3

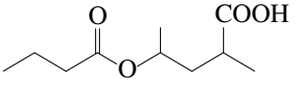
### One and More Than One Option Correct Type Question

**1.** The correct statement regarding the given compound is/are



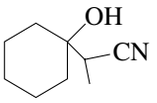

(1) Suffix of the name would be-ol
(2) Suffix of the name would be-nitrile
(3) Parent ring has two locants besides principal functional group
(4) Locant phenyl group is at fifth position of parent ring

**2.** What is/are true regarding the compound?




(1) It is a carboxy ester
(2) It is an alkanoyloxy acid
(3) Its IUPAC name is 4-carboxy-2-pentyl butanoate
(4) Its IUPAC name is 4-butanoyloxy-2-methyl pentanoic acid

**3.** What is/are wrong according to IUPAC convention in the following naming?



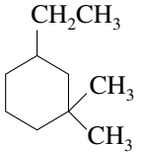

(1) Parent chain is incorrectly selected

(2) Parent chain has only three carbons

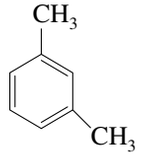
(3) Its IUPAC name is 1-(1-hydroxycyclohexyl)-1-methyl ethanenitrile

(4) Its IUPAC name is 2-(1-hydroxycyclohexyl) propanenitrile

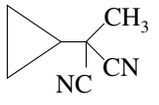
**4.** Which of the following compound(s) and their IUPAC name is/are wrongly matched?

(1) 

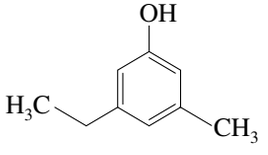

l-ethy-3, 3-dimethyl cyclohexane

(2) 


Meta-dimethyl benzene

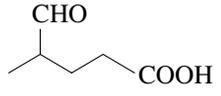
(3) 


2-cyclopropyl-2-methyl propane dinitrile

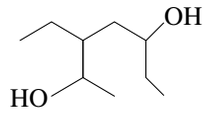
(4) 


3-ethyl-5-methyl phenol

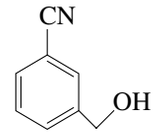
**5.** Which of the following compounds and their names are correctly matched?

(1) 

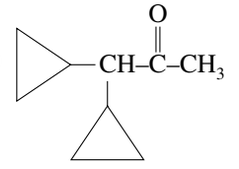

4-formyl pentanoic acid

(2) 


1,3-diethyl-1,4-butanediol

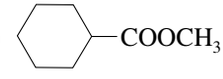
(3) 


3-hydroxymethyl benzonitrile

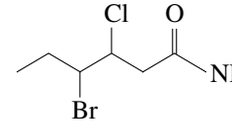
(4) 


1, 1-dicyclopropyl propanone

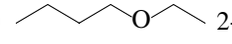
**6.** Which of the following structures and IUPAC name are incorrectly matched?

(1) 

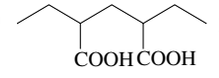
Methyl cyclohexanoate

(2) 

4-bromo-3-chlorohexanamide

(3) 

2-ethoxy pentane

(4) 

3, 5-nonanedioic acid

**7.** If an alkane $C_{10}H_{22}$ has a quaternary carbon, two tertiary carbons and six methyl groups, which of the following could be one of its correct IUPAC name?

(1) 1, 2-dimethyl-1-tertiarybutyl butane

(2) 3-ethyl-2, 2, 4-trimethyl pentane

(3) 2, 2, 3, 4-tetramethyl hexane

(4) 2, 3, 4, 5-tetramethyl hexane

## Statement Type Question

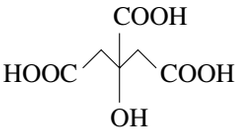
(1) If both Statement-I and Statement-II are correct and Statement-II is the correct explanation for Statement-I

(2) If both Statement-I and Statement-II are correct and Statement-II is not the correct explanation for Statement-I

(3) If Statement-I is correct and Statement-II is incorrect

(4) If Statement-I is incorrect and Statement-II is correct

**8.** **Statement-I:** The IUPAC name of citric acid is 2-hydroxy-propane-1, 2, 3-tricarboxylic acid.



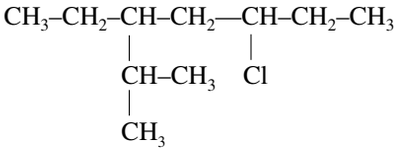

citric acid

**Statement-II:** When an unbranched C atom is directly linked to more than two like-functional groups, then it is named as a derivative of the parent alkane which does not include the C atoms of the functional group.

**9.** **Statement-I:** The IUPAC name of $CH_3$–CH=CH–C≡C–H is pent-3-en-1-yne and not pent-2-en-4-yne.

**Statement-II:** Lowest locant rule for multiple bond is preferred.

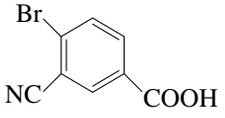
**10.** **Statement-I:** The IUPAC name for




Is 5-chloro-3-ethyl-2-methyl heptane and not 3-chloro-5-isopropyl heptane.

**Statement-II:** The parent carbon chain should contain larger number of alkyl substituents.

**11.** **Statement-I:** IUPAC name of the compound given below is 4-bromo-3-cyanobenzoic acid

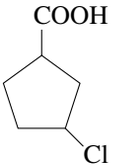



**Statement-II:** –COOH has higher priority than a cyanide group.

**12.** **Statement-I:** Dimethyl benzene can have three different IUPAC names

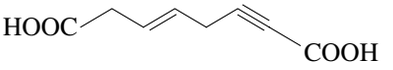
**Statement-II:** All three different names are for three positional isomers.

**13.** **Statement-I:** Following compound has its IUPAC name 3-chlorocyclopentanoic acid



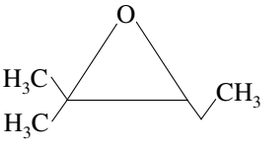

**Statement-II:** COOH is the principal functional group of compound which determines the suffix name.

**14.** **Statement-I:** IUPAC name of the following compound is oct-2-en-5-ynedioic acid




**Statement-II:** Double bond has preference over triple bond.

**15.** **Statement-I:** IUPAC name of the following compound is 2-ethyl-3, 3-dimethyl oxirane.




**Statement-II:** In oxirane, numbering starts from oxygen atom of the ring.

## Comprehension Type Question

**Passage #1 Q. 16–18**

An aromatic compound has one cyanide and two chloride groups on benzene ring. In IUPAC system, cyanide has higher priority than chloride group, therefore determine suffix of parent name of the compound.

**16.** How many different IUPAC names can be assigned to the above mentioned compound?

(1) 2 (2) 3

(3) 4 (4) 6

**17.** What is IUPAC name of the compound above which is most polar?

(1) 2, 3-dichlorobenzonitrile

(2) 2, 4-dichlorobenzonitrile

(3) 2, 6-dichlorobenzonitrile

(4) 3, 4-dichlorobenzonitrile

**18.** Which is IUPAC name of the compound above which is least polar?

(1) 2, 3-dichlorobenzonitrile

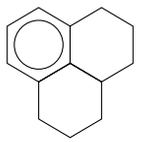
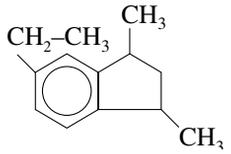
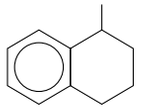
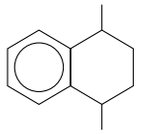
(2) 2, 5-dichlorobenzonitrile

(3) 3, 4-dichlorobenzonitrile

(4) 3, 5-dichlorobenzonitrile

## Column Matching Type Question

**19.** Match the column. (Matrix):

| | ***Column-I*** **Compounds** | | ***Column-II*** **Number of Benzylic hydrogen** |
|---|---|---|---|
| (A) |  | (P) | 2 |
| (B) |  | (Q) | 3 |
| (C) |  | (R) | 4 |
| (D) |  | (S) | 5 |

***Code***

| | *A* | *B* | *C* | *D* |
|---|---|---|---|---|
| (1) | S | R | Q | P |
| (2) | R | S | P | Q |
| (3) | S | P | R | Q |
| (4) | Q | R | S | P |

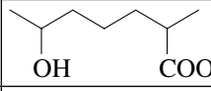
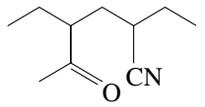
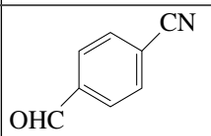
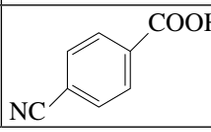
**20.** Match the IUPAC names from column-I with their features from column-II. There may be more than one match for the quantity from Column-I with the quantities from Column-II

| ***Column-I*** | | ***Column-II*** | |
|---|---|---|---|
| (A) | 3, 3, 4, 4-tetramethyl-1-pentyne | (P) | has only three carbon collinear |
| (B) | 2-butyne | (Q) | has four carbon colinear |
| (C) | 1-butyne | (R) | substitution of H by Cl gives single product |
| (D) | 2, 2, 5, 5-tetramethyl-3-hexyne | (S) | substitution of H by Cl gives three different products (excluding stereoisomers) |

***Code***

| | *A* | *B* | *C* | *D* |
|---|---|---|---|---|
| (1) | P | Q | R | S |
| (2) | P,S | Q,R | P,S | Q,R |
| (3) | P,Q | R,S | P,R | Q,S |
| (4) | P,R | PS | Q,R | R,S |

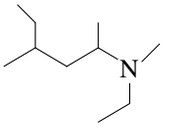
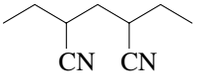
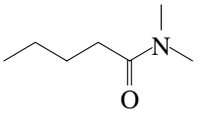
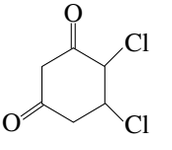
**21.**

| ***Column-I*** | | ***Column-II*** | |
|---|---|---|---|
| (A) |  | (P) | Name end with suffix 'anoic acid' |
| (B) |  | (Q) | Name end with suffix 'carboxylic acid' |
| (C) |  | (R) | Name end with suffix 'nitrile' |
| (D) |  | (S) | Parent chain/ring has six carbon atoms |

***Code***

| | *A* | *B* | *C* | *D* |
|---|---|---|---|---|
| (1) | P | R,S | R,S | Q,S |
| (2) | Q | R,S | R,S | Q,S |
| (3) | R | Q,S | P,R | R,S |
| (4) | S | P,Q | R,S | Q,S |

**22.** Match the general formula from Column-I with the class they belong to in Column-II

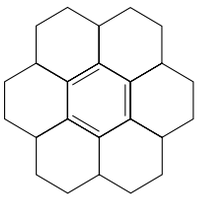
| ***Column-I*** | | ***Column-II*** |
|---|---|---|
| (A) |  | (P) has tertiary N-atom |
| (B) |  | (Q) has tertiary carbon atom |
| (C) |  | (R) has five carbons in the parent chain |
| (D) |  | (S) has six carbons in the parent chain |

***Code***

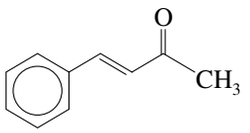
| | *A* | *B* | *C* | *D* |
|---|---|---|---|---|
| (1) | P,R,S | P,R | Q | S |
| (2) | Q | P,R,S | P,S | Q,S |
| (3) | P,Q,S | Q,R | P,R | Q |
| (4) | Q,SP, | R | S | P |

## Single Digit Integer Type Question

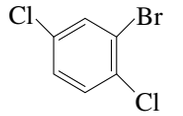
**23.** Total number of $\alpha$-hydrogen in the given following compound is:



**24.** How many carbon atom present in the parent chain in the given following compound?




**25.** If the following compound is correctly named according to IUPAC convention what would be sum of the numbers representing positions of three halide locants?

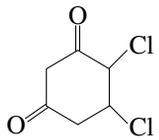



**26.** In the compound 7-ethyl 3-nonene-2, 5, 8-tricarboxylic acid, how many atoms are in $sp^2$-hybridisation state?

**27.** In 3-formy-2-methyl benzoic acid, what is the maximum number of hydrogen atoms which may lies in one single plane?

**28.** When name of hydrocarbon 3-(1-butenyl)-1, 5-hexadiene is rewritten correctly according to IUPAC convention, what would be the number of carbon atoms in the parent chain.

**29.** When the following compound is named correctly according to IUPAC convention, what would be the sum of position of two chlorine atoms?




**30.** How many secondary hydrogens are present in the alkyne named 3-ethyl-4-octyne?

## EXERCISE 4

**1.** Which of the following compounds has incorrect IUPAC name: **[AIEEE-2002]**

(1) $CH_2–CH_2–CH_2–\underset{\underset{O}{\|}}{C}–O–CH_2–CH_3$

ethyl butanoate

(2) $CH_3–\underset{\underset{CH_3}{|}}{CH}–\underset{\underset{O}{\|}}{C}–\underset{\underset{CH_3}{|}}{CH}–CH_3$

2,4-dimethyl-3-pentanone

(3) $H_3C–\underset{\underset{OH}{|}}{CH}–\underset{\underset{CH_3}{|}}{CH}–CH_3$ 2-methyl-3-butanol

(4) $CH_3–CH_2–CH_2–CHO$ butanal

**2.** The IUAPC name of $CH_3COCH(CH_3)_2$ is **[AIEEE-2003]**

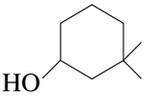
(1) 4-Methylisopropyl ketone

(2) 3-Methyl-2-butanone

(3) Isopropylmethyl ketone

(4) 2-Methyl-3-butanone

**3.** The IUPAC name of the compound is **[AIEEE-2004]**



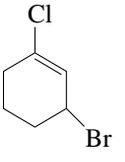

(1) 3,3-Dimethyl-1-hydroxy cyclohexane

(2) 1,1-Dimethyl-3-hydroxy cyclohexane

(3) 3,3-Dimethyl-1-cyclohexanol

(4) 1,1-Dimethyl-3-cyclohexanol

**4.** The IUPAC name of the compound shown below is **[AIEEE-2006]**



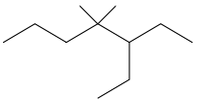

(1) 6-Bromo-2-chlorocyclohexene

(2) 3-Bromko-1-chlorocyclohexene

(3) 1-Bromo-3-chlorocyclohexene

(4) 2-Bromo-6-chlorocycohex-1-ene

**5.** The IUPAC name of is- **[AIEEE-2007]**



(1) 1, 1-Diethyl-2-dimethylpentane

(2) 4, 4-Dimethyl-5, 5-diethylpentane

(3) 5, 5-Diethyl-4, 4-dimethylpentane

(4) 3-Ethyl-4, 4 dimethylheptane

**6.** The correct decreasing order of priority for the functional groups of organic compounds in the IUPAC system of nomenclature is **[JEE Main-2008]**

(1) $-SO_3H$, –COOH, $-CONH_2$, –CHO

(2) –CHO, –COOH, $-SO_3H$, $-CONH_2$

(3) $-CONH_2$, –CHO, $-SO_3H$, –COOH

(4) –COOH, $-SO_3H$, $-CONH_2$, –CHO

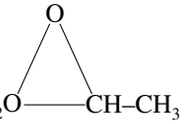
**7.** The IUPAC name of neopentane is **[JEE Main-2009]**

(1) 2-methylbutane

(2) 2,2-dimethylpropane

(3) 2-methylpropane

(4) 2,2-dimethylbutane

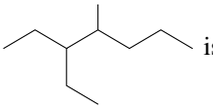
**8.** The IUPAC name of the compound  is :

**[JEE Main Online-2012]**

(1) 1, 2-Epoxy propane (2) Propylene oxide

(3) 1, 2-Oxo propane (4) 1, 2-Propoxide

**9.** The correct IUPAC name of the following compound

 is **[JEE Main Online-2014]**

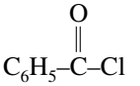
(1) 4-methyl-3-ethylhexane

(2) 3-ethyl-4-methylhexane

(3) 3,4-ethylemethylhexane

(4) 4-ethyl-3-methylhexane

**10.** The IUAPC name of the given compound is: **[IIT-2006]**



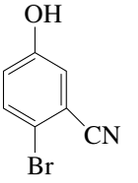
(1) Benzoylchloride

(2) Benzenecarbonylchloride

(3) Chlorophenyl ketone

(4) Phenylchloroketone

**11.** The IUPAC name of the following compound is- **[IIT-2009]**



(1) 4-Bromo-3-cyanophenol

(2) 2-Bromo-5-hydroxybenzonitrile

(3) 2-Cyano-4-hydroxybromobenzene

(4) 6-Bromo-3-hydroxybenzontrile

## ANSWER KEY

### EXERCISE # 1

| | | | | |
|---|---|---|---|---|
| 1. (4) | 2. (1) | 3. (3) | 4. (1) | 5. (3) |
| 6. (1) | 7. (2) | 8. (2) | 9. (1) | 10. (4) |
| 11. (1) | 12. (3) | 13. (3) | 14. (1) | 15. (1) |
| 16. (4) | 17. (2) | 18. (3) | 19. (2) | 20. (3) |
| 21. (3) | 22. (2) | 23. (4) | 24. (4) | 25. (1) |
| 26. (2) | 27. (4) | 28. (4) | 29. (4) | 30. (1) |
| 31. (4) | 32. (1) | 33. (4) | 34. (2) | 35. (3) |
| 36. (3) | 37. (4) | 38. (3) | 39. (2) | 40. (3) |

### EXERCISE # 2

| | | | | |
|---|---|---|---|---|
| 1. (3) | 2. (3) | 3. (3) | 4. (3) | 5. (2) |
| 6. (1) | 7. (3) | 8. (2) | 9. (4) | 10. (1) |
| 11. (3) | 12. (3) | 13. (2) | 14. (3) | 15. (2) |
| 16. (4) | 17. (4) | 18. (1) | 19. (4) | 20. (2) |
| 21. (2) | 22. (2) | 23. (2) | 24. (3) | 25. (1) |
| 26. (2) | 27. (1) | 28. (4) | 29. (4) | 30. (4) |
| 31. (3) | 32. (1) | 33. (4) | 34. (4) | 35. (1) |
| 36. (3) | 37. (3) | 38. (3) | 39. (4) | 40. (2) |

## EXERCISE # 3

| | | | | |
|---|---|---|---|---|
| 1. (2,3) | 2. (2,4) | 3. (1,4) | 4. (1,2) | 5. (3,4) |
| 6. (1,4) | 7. (2,3) | 8. (1) | 9. (1) | 10. (1) |
| 11. (1) | 12. (1) | 13. (4) | 14. (3) | 15. (4) |
| 16. (4) | 17. (3) | 18. (4) | 19. (1) | 20. (2) |
| 21. (1) | 22. (3) | 23. (6) | 24. (4) | 25. (7) |
| 26. (8) | 27. (4) | 28. (8) | 29. (9) | 30. (6) |

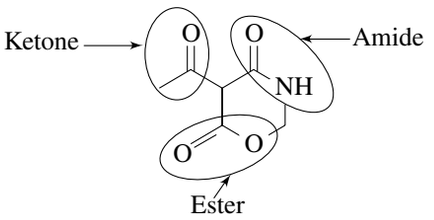
## EXERCISE # 4

| | | | | |
|---|---|---|---|---|
| 1. (3) | 2. (2) | 3. (3) | 4. (2) | 5. (4) |
| 6. (4) | 7. (2) | 8. (1) | 9. (2) | 10. (2) |
| 11. (2) | | | | |

# HINT AND SOLUTION

## EXERCISE # 1

**1. [4]**

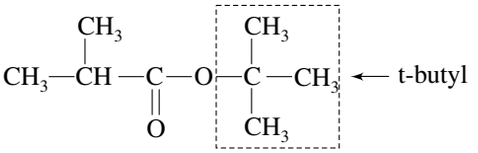



So ether group NOT present

**2. [1]**

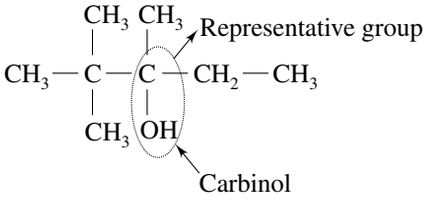
Double bond in between C–C known as olefinic bond.

**3. [3]**




t-Butyl isobutyrate

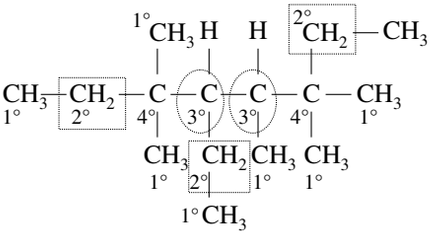
**4. [1]**




It consist 3-different alkyl radical which wright in alphabet order.

t-Butyl ethyl methyl carbinol

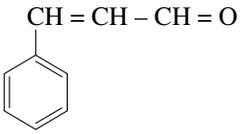
**5. [3]**




3° Carbon = 2

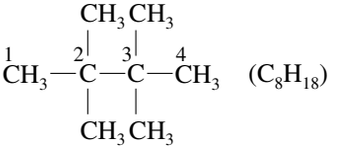
2° Hydrogen = 6

**6. [1]**




- All C are $sp^2$ hybridised
- It is planner
- IUPAC name – 3 phenyl-2 propenyl
- CHO group is not directly attach with benzen ring so it is not aromatic aldehyde.

**7. [2]**




$(C_8H_{18})$

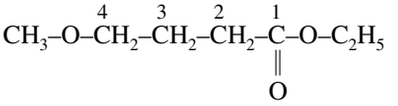
2, 2, 3, 3-tetra methyl butane

This structure have only 1°H

**8. [2]**

Principal functional group = 


Side chain = $OCH_3$ (methoxy)

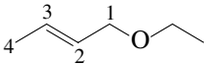



Ethyl-4-methoxy butanoate

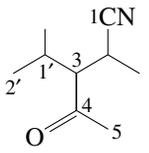
**9. [1]**

According to proirity of functional group

**10. [4]**



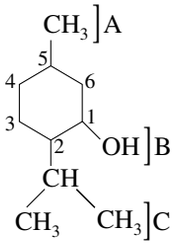
**11. [1]**




Principal functional group = CN

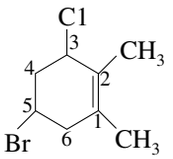
Side chain = $-\overset{\overset{O}{\|}}{C}-$, CH3, $CH(CH_3)_2$

**12. [3]**




—OH ⇒ Principal functional group has 1st locant number, then apply locant number rule A → 5, B → 1, C → 2

**13. [3]**




→ Numbering of parent chain start from double bonded C, by using alphabet rule

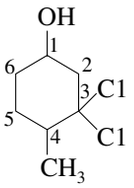
**14. [1]**

→ Maximum number of carbon containing ring selected as parent chain

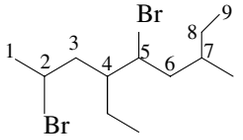
→ Cyclobutyl methyl is single complicated side chain

**15. [1]**

For numbering principal functional group (–OH) will be preferred



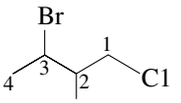

**16. [4]**




Select longest C chain

**17. [2]**

In option (2) parent chain is wrongly numbered, the correct numbering is




**18. [3]**

Molar mass = 84 is the multiple of 14

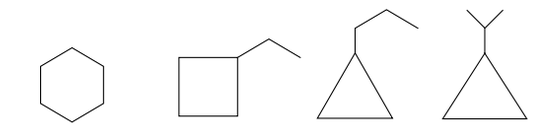
Hence molecular formula = $(CH_2)_n$

$\because \quad (12 + 2)_n = 84$

$n = 6$

$\because$ Molecular formula = $C_6H_{12}$

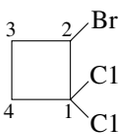
× has no double bond, it must be cycloalkane. Cyclo alkanes without methyl as locant are-



Cyclohereane ethyl cyclobutane propylcydo propane isopropyl cyloprope

**19. [2]**

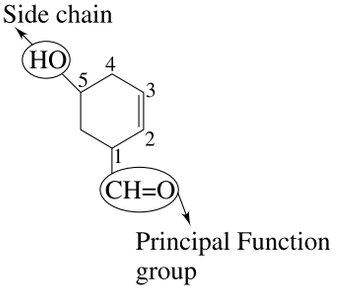
In option (2) parent chain wrongly numbered, correct numbering is




Correct name is 2-bromo-1, 1-dichloro cyclobutane according to least locant number rule

**20. [3]**

Side chain

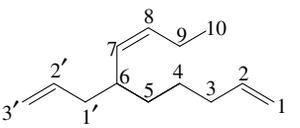



Principal Function group

Parent chain must be contain

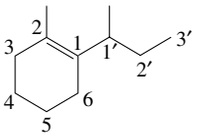
Principal functional group > multiple bond > side chain

**21. [3]**




Parent chain must contain maximum number of multiple bond and maximum number of C.

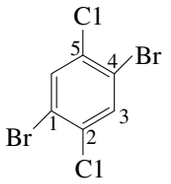
**22. [2]**



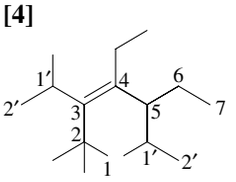
Apply alphabet rule with the preference of double bond

**23. [4]**

Numbering of parent chain according to alphabet rule

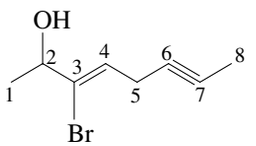


**24. [4]**

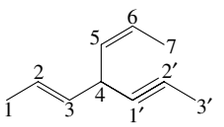


Apply least locant number rule with the preference of multiple bond.

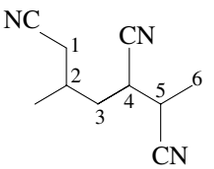
**25. [1]**



**26. [2]**

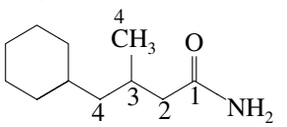


**27. [4]**



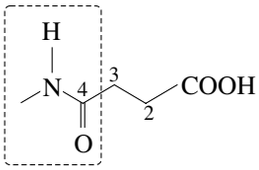
**28. [4]**

Open chain contain functional group so that it must be parent chain



Ring works as side chain

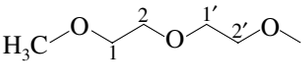
**29. [4]**



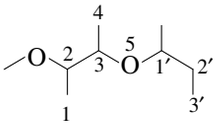
Side chain

3. (N. methly carbamoyl) propanoic acid

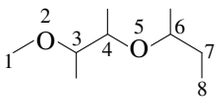
**30. [1]**



**31. [4]**



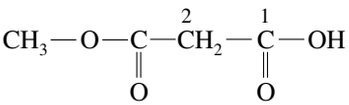
→ 2-methoxy-3-(1′ methyl propoxy) butane



As per OXA system

3, 4, 6-trimethyl-2,5-dioxa octane

**32. [1]**



2-carbomethoxy ethanoic acid

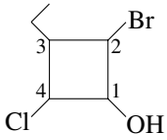
Principal functional group = COOH

Side Chain =  (esar group)

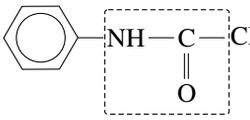
Ethanoyloxy

**33. [4]**

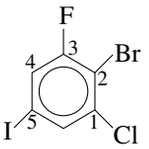
- Principal functional group = → OH
- Side chain → Bromo Chloro ethyl
- albhabet rule applies



**34. [2]**

 Principal functional group

**35. [3]**

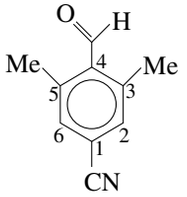


→ Apply locant number rule

→ followed by alphabet rule

2-bromo-1-chloro-3 fluoro 5-iodobenzene

**36. [3]**

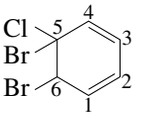


Priority – CN > –CH = O

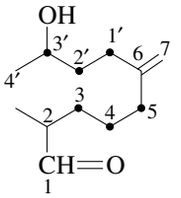
– CN ⇒ Principal functional group

– CH = O ⇒ Side chain

**37. [4]**



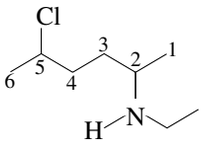
**38. [3]**



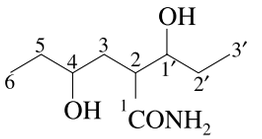
Parent chain must be preffer for numbering

functional group (–CH=O) > multiple bond (=) > side chain (–OH)

**39. [2]**

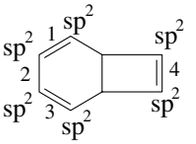


**40. [3]**



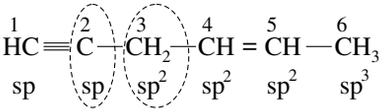
## EXERCISE # 2

**1. [3]**



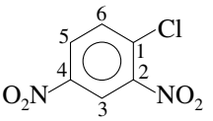
$sp^2 - sp^2$ sigma bonds = 4

**2. [3]**



**3. [3]**

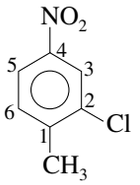
(1)



1-Chloro-2, 4-dinitro benzene (correct)

4-Chloro-1, 3-dinitro benzene (Wrong)

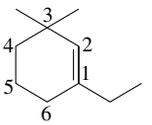
(2)



2-chloro-1methyl-4-nitro benzene (correct)

4-Methyl-5-chloronitro benzene (Wrong)

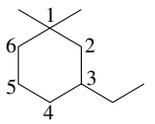
(3)



1-Ethyl-3,3-dimethyl cyclohexene (Correct)

Apply least locant number rule with the preference of multiple bond.

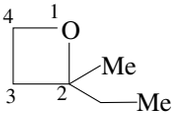
(4)



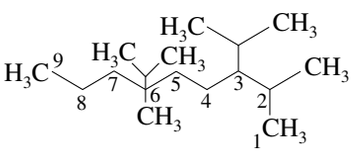
3-Ethyl-1,1-dimethyl cyclohexane (correct)

1-Ethyl-3,3-dimethyl cyclohexane (wrong)

**4. [3]**

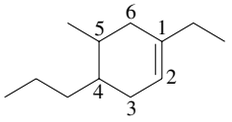


**5. [2]**



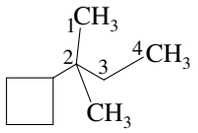
**6. [1]**

For numbering multiple bond preferred over side chain

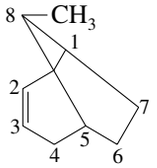


**7. [3]**

Parent chain must be contain greater number of side chain

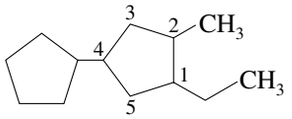


**8. [2]**

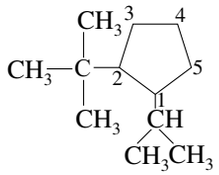


**9. [4]**

Apply least locant number rule as well abhabet rule

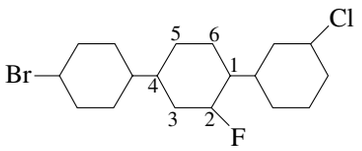


**10. [1]**



Selection of parent chain by alphabet rule

**11. [3]**

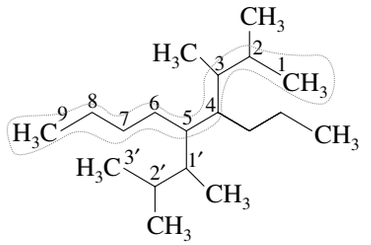


→ parent chain must be contain maximum number side chin

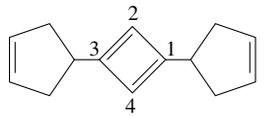
→ numbering of parent chain takes place by least locant number rule

**12. [3]**

Maximum number of continuous C-present in parent chain



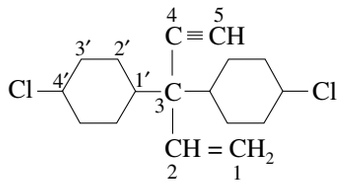
**13. [2]**



Parent chain must be contain maximum number of multiple bond.

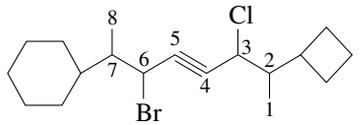
**14. [3]**

Parent chain must be contain maximum number of multiple bond



**15. [2]** Multiple bond (≡) containing chain selected as perent chain

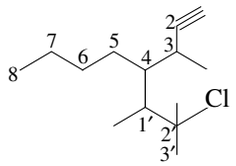
Alphabet rule applicable



**16. [4]**

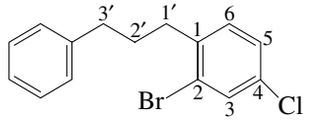
Parent chain must be contain following in given priority.

Principal function group > multiple bond > maximum number of carbon.



4-(2-chloro-1, 2-dimethylpropyl)-3methyl-1- octyne

**17. [4]**

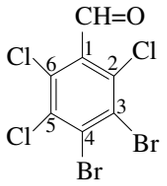


Numbering of parent chain according to least locant number rule.

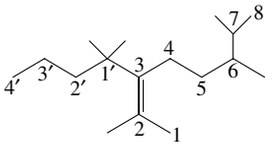
**18. [1]**

Principal functional group → –CH=O

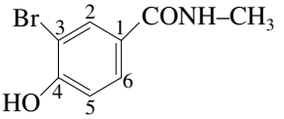
Numbering of parent chain (benzene ring) takes place according to Alphabet rule.



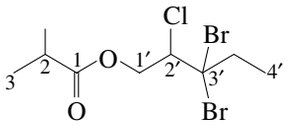

**19. [4]**



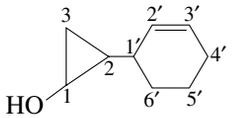
**20. [2]**




**21. [2]**

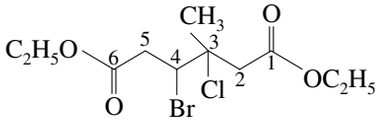



**22. [2]**

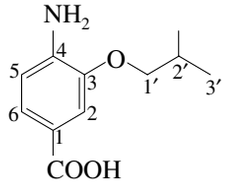



**23. [2]**

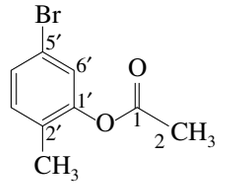
Numbering takes place according to least locant number rule



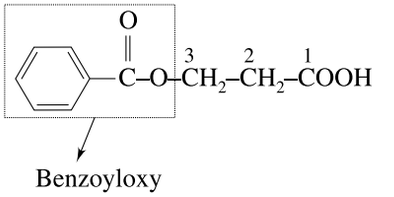

**24. [3]**



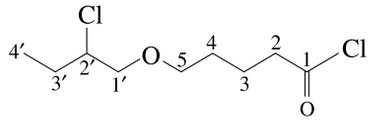

**25. [1]**




**26. [2]**

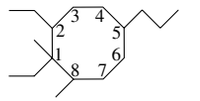



**27. [1]**



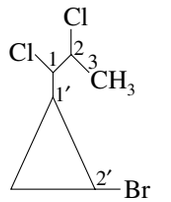

**28. [4]**

Use alphabet rule as well least locant number rule.



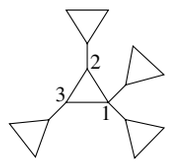
**29. [4]**

Maximum number side chain must be present in parent chain, when number of C in both (open/close) chain will be same

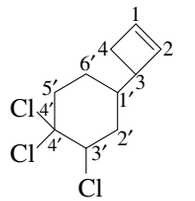



**30. [4]**

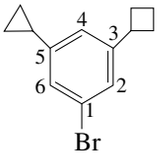
Apply locant number rule



**31. [3]** Multiple bond containing chain selected as parent chain



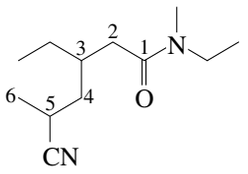
**32. [1]**



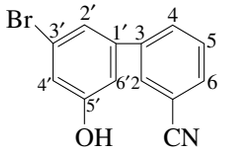
→ Aromatic ring has greater number of substituent, so that it must be parent chain

→ Numbering of parent chain takes place via alphabet rule

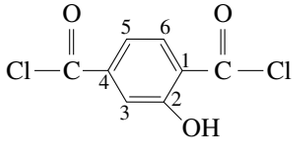
**33. [4]**



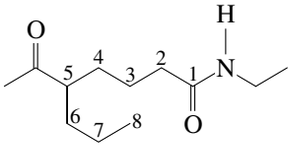
**34. [4]** Principal functional group (–C≡N). So that –C≡N containing chain selected as parent chain.



**35. [1]**



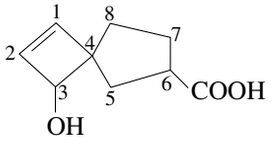
**36. [3]**



N-ethyl-6-oxo-5-propyl heptanamide (given)

Parent chain has 8 carbon so that given IUPAC name is wrong.

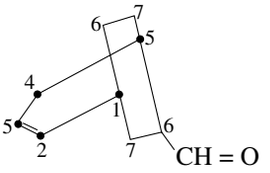
**37. [3]**



→ —COOH is Principal functional group

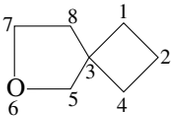
→ —OH (Side chain)

**38. [3]**



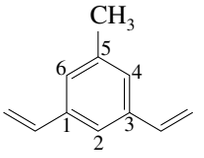
Bicyclo [3,2,2] non-2-cne-6-carbaldehyde

**39. [4]**



6-oxo-spiro [2,3] octane

**40. [2]**



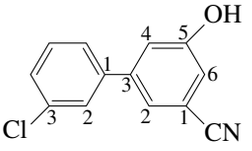
1, 3-diethenyl-5-methyl benzene

- Parent chain → benzene
- Side chain → ethenyl, methyl
- Numbering of parent chain according to Alphabet rule

## EXERCISE # 3

**1. [2, 3]**

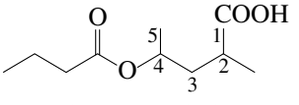
Cyanide has highest priority than hydroxyl group, hence suffix of the name would be nitrile. Other two locants on the parent phenyl ring are equidistant from –CN, numbering is done in alphabetical order as:



3-(3-chlorophenyl) 5-hydroxy benzonitrile

**2. [2, 4]**

Here, –COOH has higher priority than ester group, hence the compound is an alkanoyloxy acid, not a carboxy ester, Also,

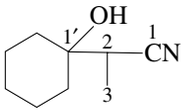


4-butanoyloxy-2-methyl pentanoic

As locant R–C– is named as alkanoyl.

**3. [1, 4]**

Cyanide has higher priority than hydroxy, compound would be numbered correctly as:




Parent chain has only three carbon.

Correct IUPAC name would be

2-(1-hydroxycyclohexyl)propane nitrile.

**4. [1, 2]**

(1) Numbering will start from carbon where two methyl groups are present and the name should be 3-ethyl-1, 1-dimethyl cyclohexane.

(2) Correct IUPAC name is 1, 3-dimethyl benzene (Meta is not used in IUPAC naming)

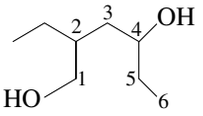
(3) It has correct name, carbons of two –CN groups are terminals of parent chain.

(4) It has correct name as –OH is the principal functional group with equidistant ethyl and methyl locants. Numbering is done in alphabetical order starting from carbon bearing –OH group.

**5. [3, 4]**

(1) Mentioned name is incorrect, carbon of –CHO is a part of parent chain as it gives the longest chain with more number of locants on it. The correct IUPAC name would be 4-methyl-5-oxopentanoic acid.

(2) The mentioned name is wrong as it has smaller parent chain. The correct name would be




2-ethyl-1, 4-hexanediol

(3) and (4) are correctly named.

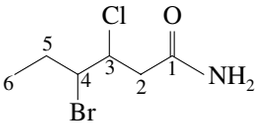
**6. [1, 4]**

(1) When carbon containing principal functional group is directly on a ring, normal suffix (hereoate) cannot be used. In present case, carboxylate suffix should have been used and correct IUPAC name would be "methyl cyclohexane carboxylate".

(4) When there are two carbon containing principal functional groups (now –COOH), their carbon atoms become terminals of the parent chain irrespective of chain length, The correct name of this compound would be 2-butyl-4-ethyl pentane-dioic acid.

(3) and (4) have correct IUPAC names mentioned as:

(2)




4-bromo-3-choro hexanamide

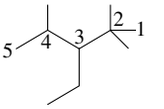
(3)


2-ethoxy pentane

**7. [2, 3]**

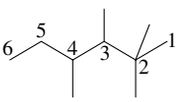
In option (1), the longest alky chain has not been considered as parent chain. Both (2) and (3) satisfy the given condition.

(2)




3-ethyl-2,2,4-trimethyl pentane

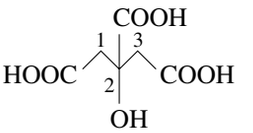
(3)




2,2,3-4-tetramethyl hexane

In (4), there is no quaternary carbon atom.

**8. [1]**




Citric acid

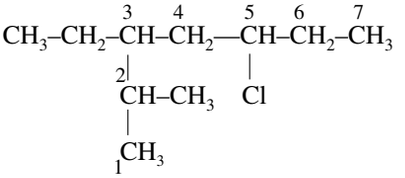
2-hydroxy-propane-1, 2, 3-tricarboxylic acid.

**9. [1]**

$\underset{5}{CH_3}\text{–}\underset{4}{CH}\text{=}\underset{3}{CH}\text{–}\underset{2}{C}\equiv\underset{1}{C}\text{–H}$ pent 3 en-1-yne

because Numbering takes place according to lowest locant rule.

**10. [1]**

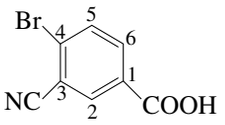



- When parent chain have same number of carbon from either side then maximum substituents contains chain must be preferred

• Numbering takes place according to lowest locant rule.

**11. [1]**

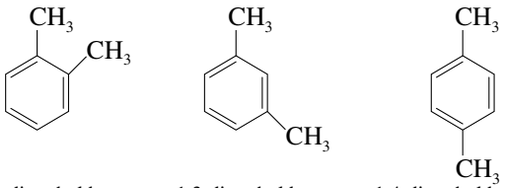
–COOH group has higher priority than –CN, hence numbering is started from the ring carbon where –COOH is present.




4-bromo-3-cyano benzio acid

**12. [1]**

There are only three positional isomers possible for dimethyl benzene




1,2-dimethyl benzene 1,3-dimethyl benzene 1,4-dimethyl benzene

Hence, the IUPAC name possible for dimethyl benzene.

**13. [4]**

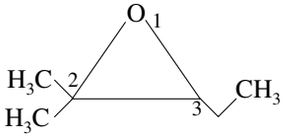
–COOH is directly on cyclopentane ring, its correct IUPAC name woud be 3-chlorocyclopentane carboxylic acid.

**14. [3]**

Double bond has no preference over triple bond. In the given dioic acid, both double and triple bonds are equidistant from terminals, numbering has been done in alphabetical order where 'ene' comes before y of 'yne'.

**15. [4]**

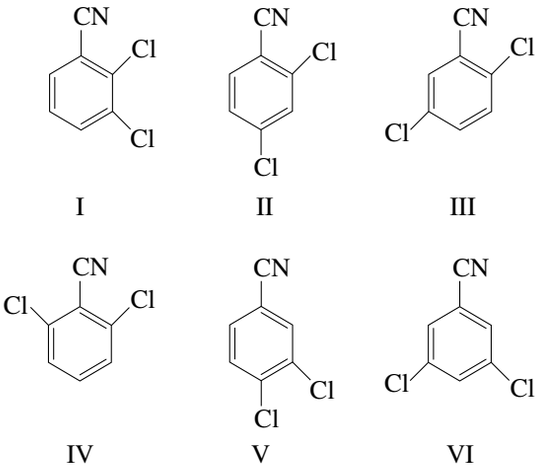
Numbering starts from oxygen in case of oxirane. However, the number series with smaller number at first occasion of difference will be the correct one as:




The correct IUPAC name of this compound is 3-ethyl-2, 2-dimethyl oxirane.

**16. [4]**

The six different isomers of the given compound are




**17. [3]**

The structure IV is most polar as the resultant of two C–Cl dipole vectors would be aligned with –CN dipole, would be added giving maximum dipole moment.

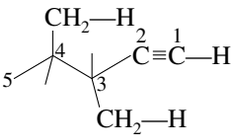
**18. [4]**

The structure VI is least polar because the resultant of two C–Cl dipole vectors would be at 180° angle to –CN dipole and in opposite direction.

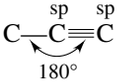
**19. [1]**

Carbon atom directly attached with benzene ring is benzylic C and H attached to such C- known as benzylic H.

**20. [2]**

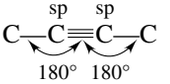
(A) 


Carbon 1, 2 and 3 are collinear as




Also, it has only three (underdline) non-equivalent hydrogen, gives three chloro alkynes in substitution reaction.

(A) → (P, S)

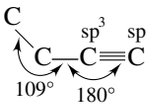
(B) 


All four carbons are colinear

Also, it has all six hydrogen equivalent, hence only one product after a hydrogen is substituted by chlorine.

(B) → (Q, R)

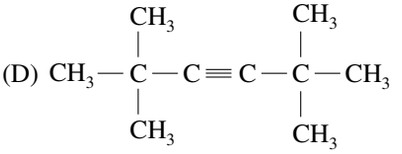
(C) $CH_3—CH_2—C\equiv C—H$




Only three carbons collinear

Also, it has three non-equivalent (underline) hydrogens, hence gives three different products after substitution of a H by Cl.

(C) → (P, S)

(D) 

Hence, the two sp-hybridised carbons and two $\alpha$-carbon bonded to sp carbons are collinear.

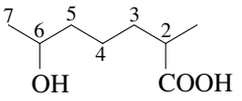
Also, all its hydrogen atoms are equivalent, gives only one chlorinated product on substitution of a H by Cl.

(D) → (Q, R)

**21. [1]**

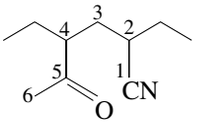
**(A) → (P); (B) → (R, S); (C) → (R, S); (D) → (Q, S)]**

(A) Naming ending with anoic acid and parent chain has seven carbon atoms.



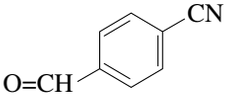

6-hydroxy-2-methyl heptanoic acid

(B) Name ending with nitrile and parent chain six carbon atoms.



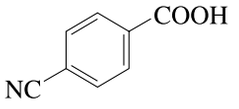

2,4-diethyl-5-oxohexanenitrile

(C) Name ending with nitrile and parent chain has six carbon atoms.




4-formylbenzontrile

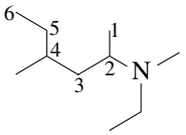
(D) Name ending with suffix nitrile and the parent phenyl ring has six carbon atoms.



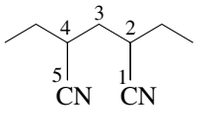

4-cyano benzene carboxylic acid

**22. [3]**

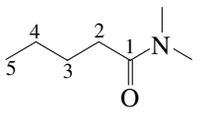
**(A) → (P, Q, S); (B) → (Q, R); (C) → (P, R); (D) → (Q)**

(A) 


It has 3° N-atom. Parent chain has six carbon atoms. It has C-4 and C-2 tertiary carbon.

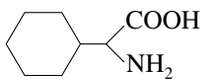
(B) 


It has no tertiary N-atom. C-2 and C-4 are tertiary carbon. Parent chain has 5 carbon.

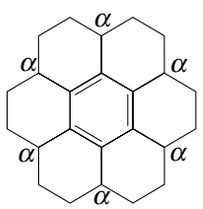
(C) 


Its nitrogen is tertiary. Parent chain has five carbon.

(D) It has two tertiary carbon. Parent chain has only two carbon.



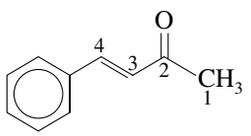

**23. [6]**




Each indicated $\alpha$–C have 1$\alpha$–H

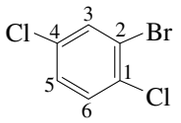
So total number of $\alpha$–H = 6.

**24. [4]**




Functional group containing chain selected as parent chain.

**25. [7]** Apply least locoint number rule

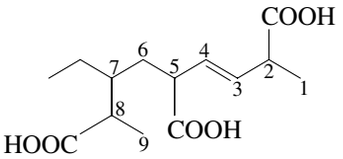


2-bromo-1,4-dichloro benzene

**26. [8]**

All three carbon of three –COOH are $sp^2$.

Three oxygen, one in each –COOH are $sp^2$.

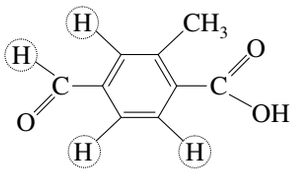


7-ethyl-3-noene-2,5,8-tricarboxyic acid

Both C-3 and C-4 carbons are $sp^2$.

**27. [4]**

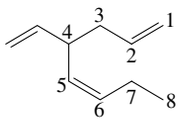
The structure of given compound is



Only hydrogen atoms attached to $sp^2$ hybridised carbon atoms can be coplanar. Labelled hydrogens are coplanar.

**28. [8]**

It has a further longer chain than the one indicated in the given name.

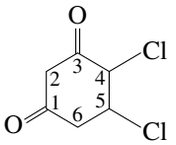


Given: 3-(-1-butenyl)-1, 5-hexadiene

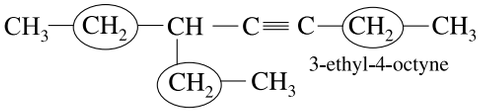
IUPAC: 4-ethenyl-1, 5-octadiene

**29. [9]**

When this compound is numbered correctly as sum of position of two chorine atoms is



**30. [6]**

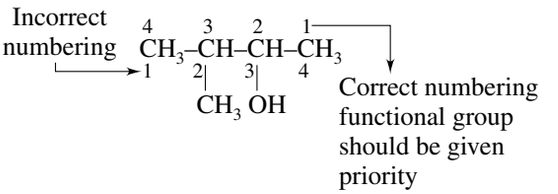


3-ethyl-4-octyne

Al the hydrogens of $–CH_2–$ are secondary, hence 8 secondary H.

## EXERCISE # 4

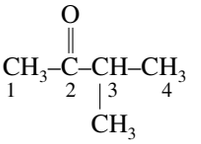
**1. [3]**



Incorrect numbering

Correct numbering functional group should be given priority

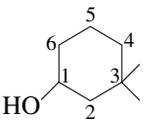
**2. [2]**



3-methyl butan-2-one or 3-methyl-2-butanone

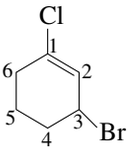
Keto (–C–) functional group is given priority.

**3. [3]**



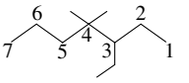
Carbon with –OH group is given $C_1$, thus it is 3,3-dimethyl-1-cyclohexanol.

**4. [2]**



Unsaturation (double bond) is given priority over halogen, So, the correct IUPAC name is 3-Bromo-1-chlorocyclohexene

**5. [4]**

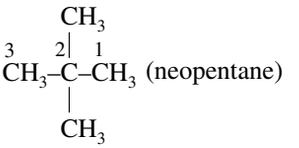


Numbering of parent chain takes place according to least locant number rule thus correct IUPAC name is 3-Ethyl-4, 4 dimethylheptane.

**6. [4]**

According to priority table of functional group.

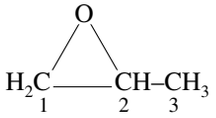
**7. [2]**



(neopentane)

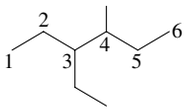
2,2-dimethylpropane.

**8. [1]**



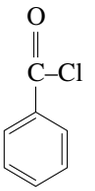

1, 2-Epoxy propane

**9. [2]**



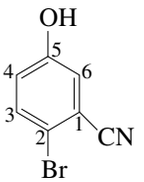

Alphabet rule applicable because least locant number rule failed thus correct IUPAC name is 3-ethyl-4-methylhexane

**10. [2]**




Parent chain is benzene ring so that correct IUPAC name is Benzenecarbonylchloride

**11. [2]**




Principal group CN gets 1st locant number followed by least locant number rule thus correct IUPAC name is 2-Bromo-5-hydroxybenzonitrile.