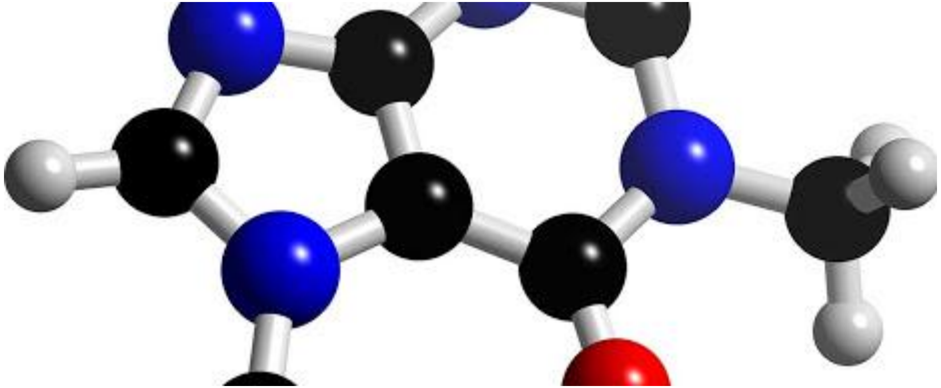
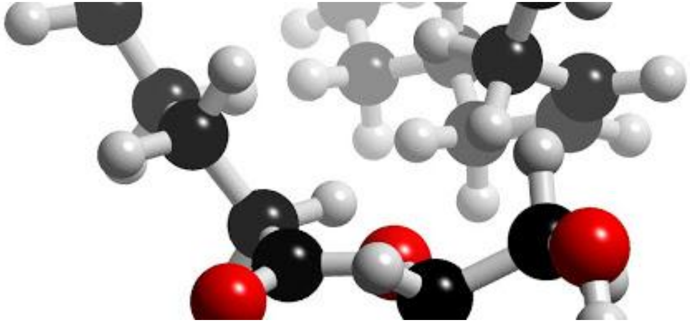
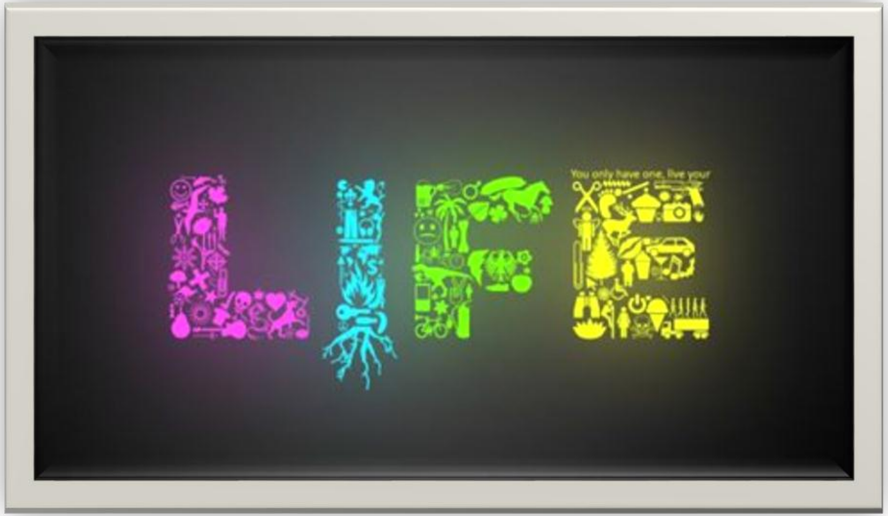
ORGANIC CHEMISTRY –
SOME BASIC PRINCIPLES & TECHNIQUES





INTRODUCTION OF ORGANIC CHEMISTRY

ORGANIC



What does the word ‘organic’ means ?

Organic compounds are derived from living organisms.

ORGANIC CHEMISTRY

It is the study of compounds extracted from living organisms.

Organic Compounds → **Contains carbon**

↓

It shows catenation.
(Ability of carbon atoms to combine, forming long chains)

Organic Chemistry

↓

Carbon Chemistry

Introduction

What are organic compounds ?

Compounds which contain carbon

But ….

So, the correct classification of the compounds is

Organic compounds	Inorganic compounds
CH_4	$NaCl$
$C_6H_{12}O_6$	HCl
C_2H_5OH	H_2SO_4
	$NaOH$
	CO_2
	CO
	Na_2CO_3
	$NaHCO_3$
	NH_4CNO

CO, CO_2, metal carbonates and bicarbonates, cyanates are inorganic compounds though they contains carbon, because these compounds do not follow the properties of organic compounds.

Organic Compounds	Inorganic Compounds
Extracted from living organism e.g.- Sugar ,  Urea , etc. 	Study of non–living organism such as Rocks,  minerals, etc. 

In 1815	Berzelius
	

Proposed that a vital force was responsible for the formation of organic compounds

In 1828	Wohler
	

$$NH_4CNO \xrightarrow{\Delta} H_2N - \underset{\underset{\displaystyle O}{\|}}{C} - NH_2$$

(ammonium cyanate) (Inorganic)

(Urea) (Organic)

Synthesized first organic compound urea from inorganic compound.

So, Vital force theory was disproved by Wohler

In 1845	Kolbe
	
Synthesized acetic acid from its elements.	

In 1856	**Berthelot**
	
Synthesized methane.	

1. Organic compounds are extracted from…

1) Living organisms

2) Non living organisms

3) Earth crusts

4) Sea

MCQs

Answer

2. **First synthesized organic compound urea was obtained from…**

1) **Ammonium cyanide**

2) **Ammonium cyanate**

3) **Ammonium nitrate**

4) **All of these**

Answer

IMPORTANCE OF ORGANIC CHEMISTRY

Importance of organic chemistry

Organic compounds are used in ……

1) **Pharmaceutical industries**

Medicines

2) **Petroleum industries**

LPG, kerosene, etc.

Importance of organic chemistry

3)	Dye industries	
4)	Polymer industries	 

Indigo, azo dyes, etc.

Nylon, terylene, etc.

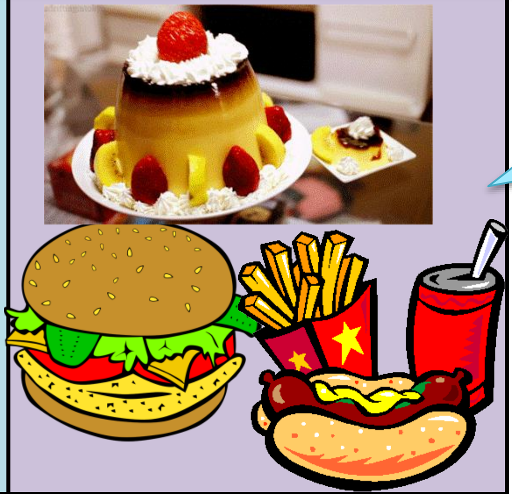
Importance of organic chemistry

5)	Plastic industries	
6)	Cosmetic industries	

Plastic bags, bottles, etc.

Perfumes, creams, talcum powders, etc.

Importance of organic chemistry

7)	**Food industries**	
8)	**Fertilizer industries**	

Carbohydrates, fats, proteins, sweetening and flavouring agents, etc.

Urea

Importance of organic chemistry

9)	Textile industries	 
10)	Soap industries Soap products	

Nylon fibres, terylene fibres, natural and synthetic fibres, etc.

- **Organic chemistry is the study of hydrocarbons and their derivatives**
- **Organic compounds are numerous in number due to**

    i) High catenation Carbon ability
    ii) Higher C-C bond dissociation energy
    iii) Carbon tetravalency.(Quadrivalency)
    iv) Compounds exhibiting isomerism.
    v) Carbon exhibiting bond multiplicity.

- **Ability of carbon atom to form long chains or rings is known as catenation.**
- **The element with highest catenation ability is carbon.**

- **The ability of carbon atom to form four bonds is known as tetra valency.**

- **To exhibit tetravalency carbon forms**

  i) All four single bonds

  ii) Two double bonds

  iii) One double bond, two single bonds

  iv) One triple bond, one single bond

- **Ground state electronic configuration of carbon is $1s^2\ 2s^2\ 2p^2$**

  Excited state electronic configuration of carbon is $1s^2\ 2s^1\ 2p_x^1\ 2p_y^1\ 2p_z^1$

- **For excitation, energy required is 501.6 $KJmol^{-1}$**

Sl. no:	Hydro carbon	Hybridisation	C-C bond length	C-H bond length	Shape & Bond angle
1	Alkane	sp^3	1.54 A^0	1.09A^0	Tetrahedral $109^o28'$
2	Alkene	sp^2	1.34 A^0	1.08 A^0	Trigonal planar 120^o
3	Alkyne	sp	1.20 A^0	1.06 A^0	Linear 180^o

σ and π bonds :

- σ Bond is formed by linear overlapping of atomic orbitals or hybrid orbitals.
- π Bond is formed by lateral overlapping of pure atomic orbitals.

Types of carbon and hydrogen:

- *Primary carbon (1^0 - carbon)*: Carbon is bonded to another carbon.
- *Primary hydrogen:* Hydrogen attached to primary carbon.

Types of carbon and hydrogen:

- ***Secondary carbon (2^0 - carbon)*:** **Carbon is bonded to another two carbon atoms.**
- **Secondary hydrogen is attached to secondary carbon.**
- ***Tertiary carbon (3^0 - carbon)*:** **Carbon is bonded to another three carbon atoms.**
- **Tertiary hydrogen is attached to tertiary carbon.**
- ***Quaternary carbon (4^0 - carbon)*:** **Carbon is bonded to another four carbon atoms.**

Structural representation of organic molecules :

1. Complete structural formula:

$$
\begin{array}{ccccccc}
 & & H & & H & & \\
 & & | & & | & & \\
H & - & C & - & C & - & H \\
 & & | & & | & & \\
 & & H & & H & &
\end{array}
\qquad\qquad
\begin{array}{ccccccc}
 & & H & & H & & \\
 & & | & & | & & \\
H & - & C & = & C & - & H
\end{array}
$$

Ethane ***Ethene***

Structural representation of organic molecules :

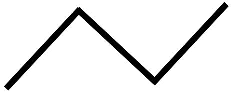
2. Condensed structural formula:

CH_3CH_3 $CH_2 = CH_2$

Ethane *Ethene*

3. Bond line formula:

C_4H_{10} :



Butane *Cyclo butane*

Structural representation of organic molecules :

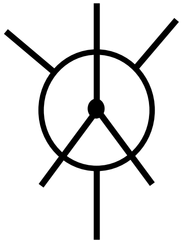
4. Three dimensional representation of organic molecules :

a. Wedge & dash formula

(Solid wedge)

(Dashed wedge)

b. Newman projections:



MCQs

Answer

1. ___ was the first organic compound synthesized.

1) Acetic acid

2) Urea

3) Methane

4) Ethane

2. Urea was synthesized by ________

1) Wohler

2) Kolbe

3) Berthelot

4) Berzelius

Answer

3. Kolbe synthesized ______

1) Urea

2) Acetic acid

3) Urotropine

4) Methane

Answer

4. Methane was synthesized by ______

) Berthelot

2) Berzelius

3) Kolbe

4) Wohler

Answer

5. Vital force theory was put forward by ________

1) Berthelot

2) Kolbe

3) Wohler

4) Berzelius

Answer

CHARACTERISTICS OF ORGANIC COMPOUNDS :

Characteristics of organic compounds :

1)	Composition	Mainly contains carbon. It may contain H, O, S, N, X.
2)	Catenation	The ability of 'C' atoms to combine with one another to form long chains or rings.
3)	Conduction Property	Bad conductor of heat and Electricity
4)	Complexity	Most of the organic compounds form complexes

Characteristics of organic compounds :

5)	Combustibility	Most of the organic compounds are combustible i.e., reacts with O_2
6)	Melting and boiling point	Most of the organic compounds have low melting and boiling points

Characteristics of organic compounds :

7)	Isomerism	Compounds having same molecular formula but different structural formulae are called isomers and this property of organic compounds is known as isomerism.
8)	Solubility	Most of the organic compounds are insoluble in water but soluble in organic solvents.

Characteristics of organic compounds :

9)	Stability	Most of the organic compounds are less stable
10)	Multiple bonds	Carbon Can form multiple bonds, C–C, C = C, C ≡ C
11)	Linkage	Covalent linkage
12)	Polymerisation	Undergoes polymerisation for e.g. Ethene gives Polythene

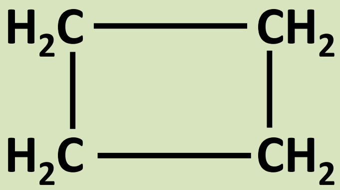
Characteristics of organic compounds :

13)	Rate of reaction	Depending upon reactivity of the compounds, rate of reaction varies. Covalent organic reactions are generally slow
14)	Odour	Have characteristic odour eg. Ester $\rightarrow$ Sweet pleasant Amines $\rightarrow$ fishy.

Characteristics of organic compounds :

15)	Functional group	It is a part of the molecule or characteristic group of the molecules which largely determines properties of organic compound is called functional group e.g. –COOH (Carboxylic acid), – CHO (aldehyde), etc.
16)	Homologous series	A class of compounds in which successive members differ by $-CH_2-$ group are called homologous and the series of compounds is called homologues series. Ex: alkanes CH_4,C_2H_6,C_3H_8,C_4H_{10},C_5H_{12}

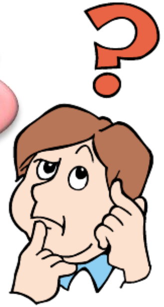
Classification of Organic compounds based on structure

$CH_3 - CH_2 - CH_2 - CH_3$	n–butane
	cyclobutane

n– butane is an open chain compound

Cyclobutane is a closed chain compound

What is the difference between this two structures ?



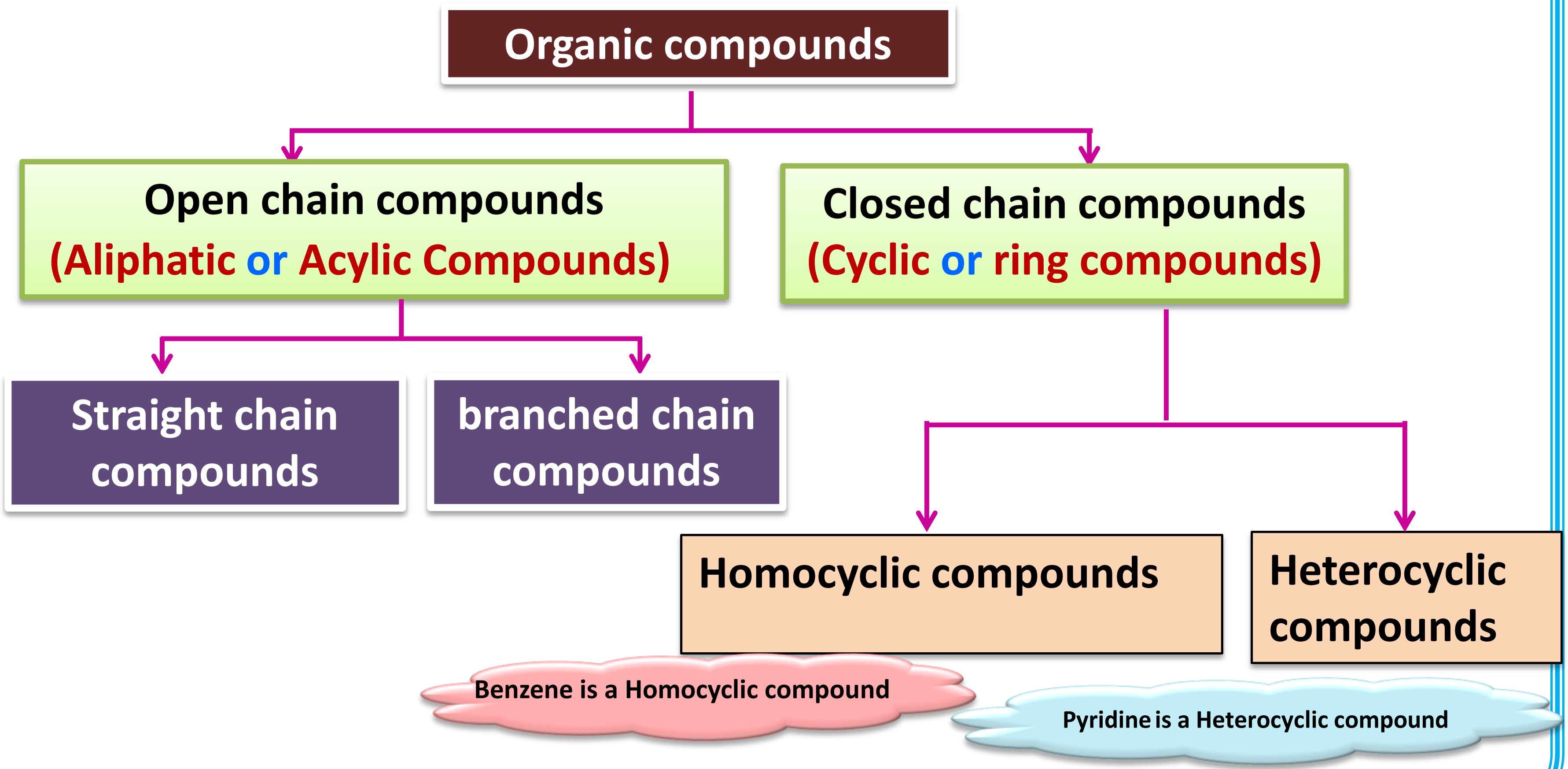
Open chain compounds
(Aliphatic or Acylic Compounds)

$CH_3 - CH_2 - CH_2 - CH_3$	n–butane
$CH_3 - CH(CH_3) - CH_3$	isobutane

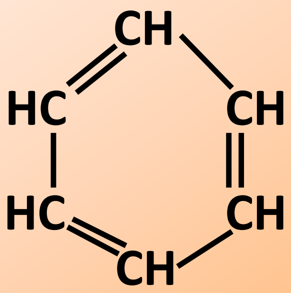
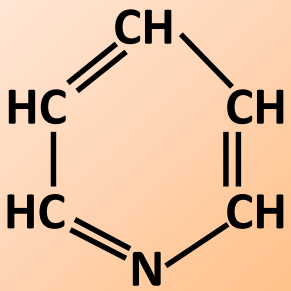
n– butane is a straight chain compound

isobutane is a branched chain compound

What is the difference between this two structures ?

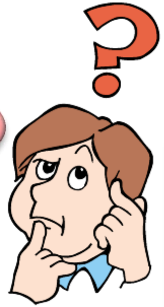

Organic compounds
Open chain compounds
(Aliphatic or Acylic Compounds)
Closed chain compounds
(Cyclic or ring compounds)
Straight chain compounds
branched chain compounds
Homocyclic compounds
Heterocyclic compounds
Benzene is a Homocyclic compound
Pyridine is a Heterocyclic compound

Closed chain compounds (Cyclic or ring compounds)

	
Benzene	Pyridine

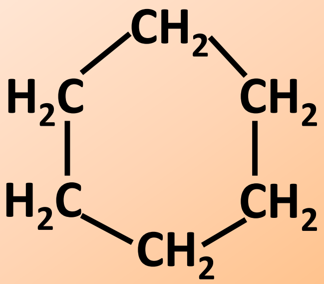
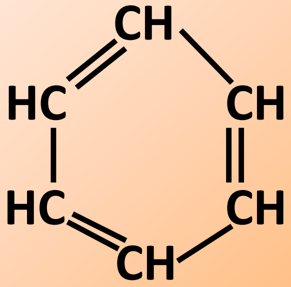
Compounds which include one or more hetero atoms like oxygen, nitrogen, sulphur, etc. in the ring of carbon atoms.

What is the difference between this two structures ?



Second structures has nitrogen as a hetero atom in the ring of carbon atoms.

Homocyclic compounds (carbocyclic compounds)

	
Cyclohexane	Benzene

If homocyclic compounds contain at least one aromatic ring which resembles benzene in their chemical behaviour then those compounds are known as an aromatic compound

If in homocyclic compounds, carbon atoms are linked by single bonds only then the compounds are known as Alicyclic compounds

Benzene is a Aromatic compound

Cyclohexane is a Alicyclic compound

What is the difference between this two structures ?

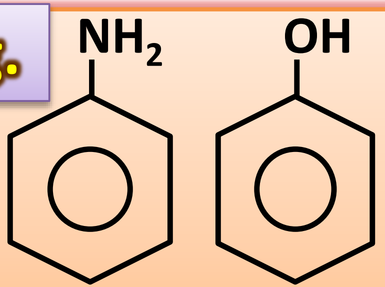
Homocyclic compounds

Aromatic compounds

Benzenoid compounds

Contain at least one benzene ring

eg.



Aniline Phenol

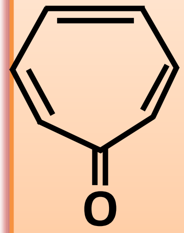
Homocyclic compounds

Aromatic compounds

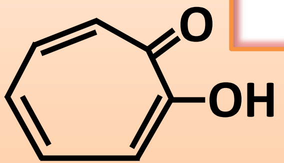
Non-Benzenoid compounds

Contain an aromatic ring other than benzene

eg.



Tropone



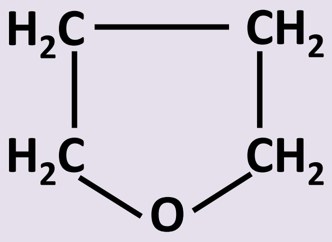
Tropolone

Heterocyclic compounds

Hetero - alicyclic compounds

Alicyclic compounds which contain at least one heteroatom in the ring

eg.

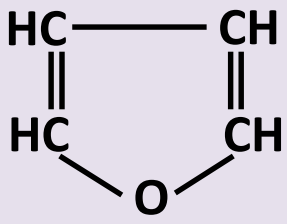


Tetrahydrofuran (THF)

Heterocyclic compounds

Hetero - aromatic compounds

eg.



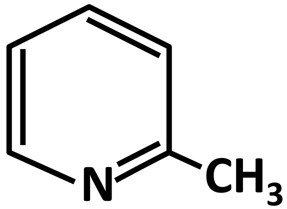
Furan

Aromatic compounds which contain at least one heteroatom in the ring

Hetero-aromatic compounds

Benzenoid compounds

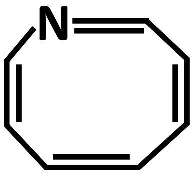
eg.



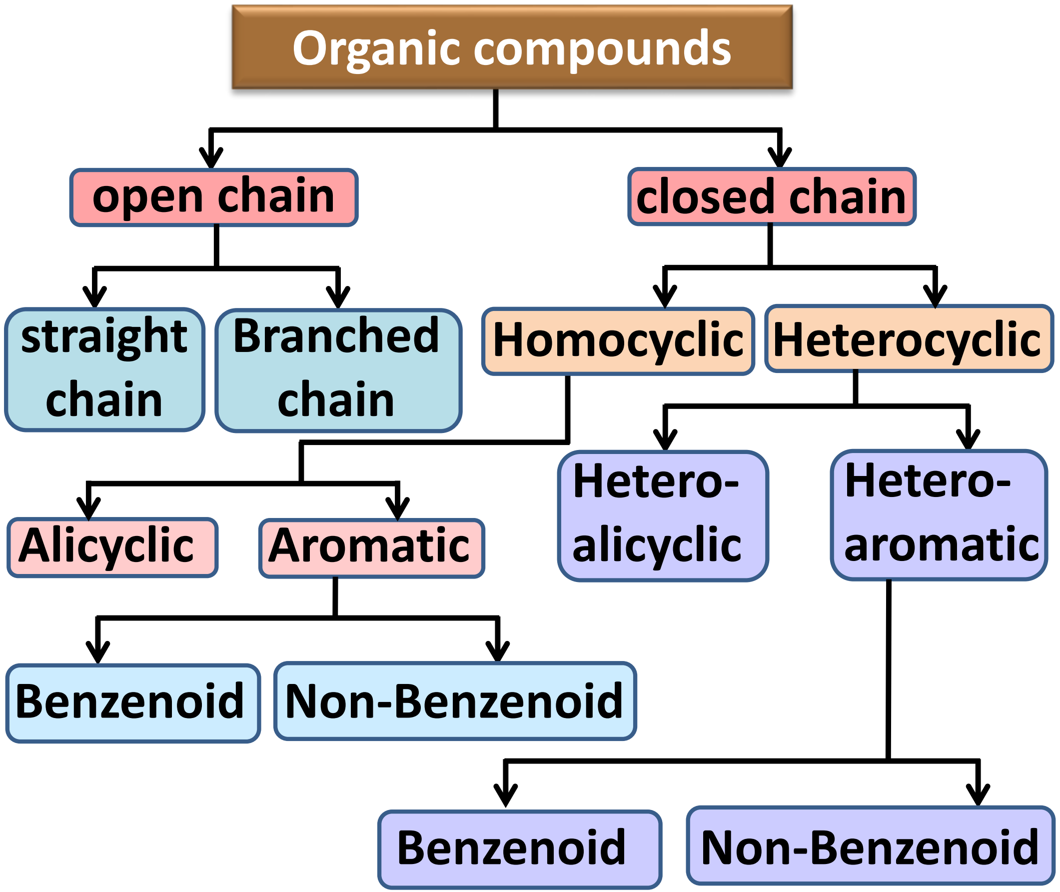
Picoline

Non-benzenoid compounds

eg.



Azocine

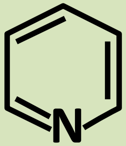

Organic compounds
open chain
closed chain
straight chain
Branched chain
Homocyclic
Heterocyclic
Alicyclic
Aromatic
Hetero-alicyclic
Hetero-aromatic
Benzenoid
Non-Benzenoid
Benzenoid
Non-Benzenoid

Q. Give the class of the following compounds based on their structures

No.	Structure	Name
1.	$H_3C - \underset{\underset{CH_3}{\vert}}{CH} - CH_3$	isobutane

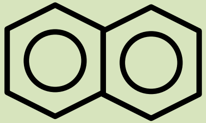
Class of a compound
Open chain compound ↓ Branched chain compound

Q. Give the class of the following compounds based on their structures

No.	Structure	Name
2.		pyridine

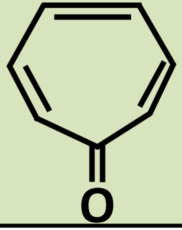
Class of a compound
Closed chain compound ↓ Hetero-aromatic compound ↓ Benzenoid compound

Q. Give the class of the following compounds based on their structures

No.	Structure	Name
3.		Naphthalene

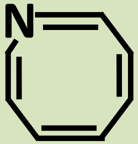
Class of a compound
Closed chain compound ↓ Homocyclic compound ↓ Aromatic compound ↓ Benzenoid

Q. Give the class of the following compounds based on their structures

No.	Structure	Name
4.		Tropone

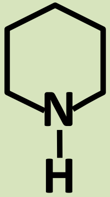
Class of a compound
Closed chain compound ↓ Homocyclic compound ↓ Aromatic compound ↓ Non- Benzenoid

Q. Give the class of the following compounds based on their structures

No.	Structure	Name
5.		Azocine

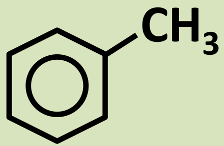
Class of a compound
Closed chain compound ↓ Hetero-aromatic compound ↓ Non-Benzenoid

Q. Give the class of the following compounds based on their structures

No.	Structure	Name
6.		Piperidine

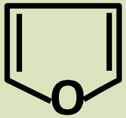
Class of a compound
Closed chain compound ↓ Hetero-alicyclic compound

Q. Give the class of the following compounds based on their structures

No.	Structure	Name
7.		Toluene

Class of a compound
Closed chain compound ↓ Homocyclic compound ↓ Aromatic compound ↓ Benzenoid

Q. Give the class of the following compounds based on their structures

No.	Structure	Name
8.		Furan

Class of a compound
Closed chain compound ↓ Hetero-aromatic compound

Homologous series

- Successive members of the series differ from each other by methylene group ($–CH_2–$)

For eg. A series of alkane

1) $H – CH_2 – H$ (Methane)
2) $H – CH_2 – CH_2 – H$ (Ethane)
3) $H – CH_2 – CH_2 – CH_2 – H$ (Propane)

Characteristics of Homologous series

1)	Homologous can be represented by the same general formula.
2)	Homologous have the same functional group.
3)	Since the successive members differ from their molecular formula by $-CH_2-$ group, they differ in molecular weight by 14 units.
4)	Homologues can be prepared by similar chemical methods.

Characteristics of Homologous series

5)	Homologues show similar chemical Properties.
6)	Homologues show gradation in physical properties such as melting point, boiling point, density, solubility, etc.

1. Organic compound mainly contains ______

1) H

2) C

3) O

4) N

MCQs

Answer

2. Successive members of homologous series differ from ______ group

Answer

1) Methyl

2) Methine

3) Methylene

4) Nitro

3. Successive members of homologous series differ from their molecular weight by ______ units

Answer

1) 12

2) 14 ✓

3) 8

4) 18

4. 3rd homologue of methane is ______

1) Propane

2) Ethane

3) Butane

4) Pentane

Answer

5. **Most of the organic compounds are soluble in ______ solvent.**

Answer

1) **Polar**

2) **Non-polar** ✓

3) **Both a & b**

4) **None of these**

IUPAC

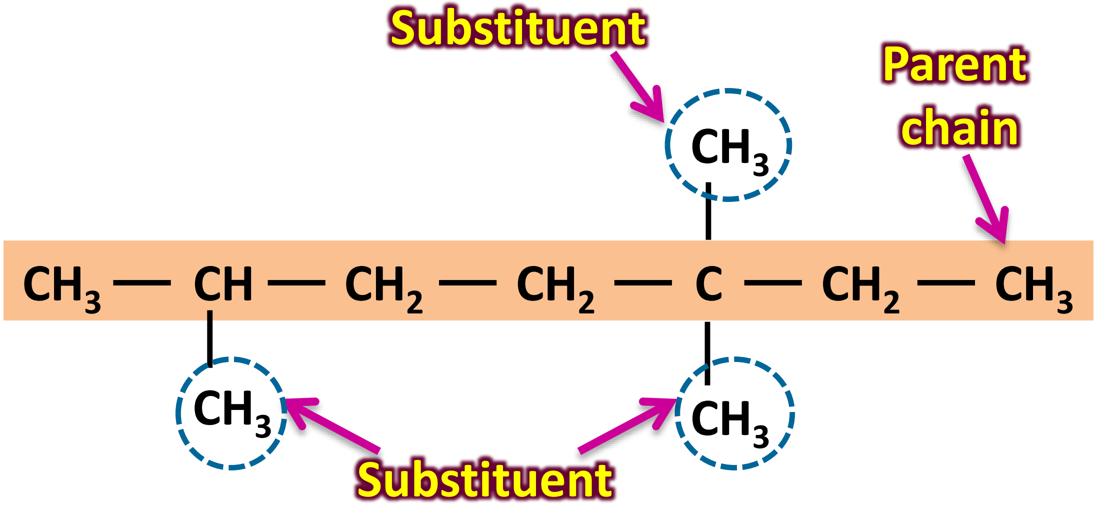
NOMENCLATURE

Rule 1

Rules

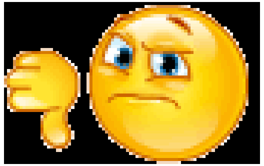
1) Longest chain rule :

Select the longest continuous chain of carbon atoms. This is called the parent chain, carbon atoms which are not included in the parent chain are called as branched chain or substituent.



Note It may be noted that the longest chain may or may not be straight but it must be continuous.

Wrong chain



$$\overset{1}{CH_3}-\overset{2}{\underset{}{CH}}(CH_3)-\overset{3}{CH_2}-\overset{4}{CH_2}-\overset{5}{CH_2}-\overset{6}{CH}(CH_2-CH_2-CH_3)-\overset{7}{CH_3}$$

(Contain 7 C atoms)

Correct chain

$$\overset{1}{CH_3}-\overset{2}{CH}(CH_3)-\overset{3}{CH_2}-\overset{4}{CH_2}-\overset{5}{CH_2}-\overset{6}{CH}(CH_3)-\overset{7}{CH_2}-\overset{8}{CH_2}-\overset{9}{CH_3}$$

(Contain 9 C atoms)

Rule 2

Lowest number rule :

Number the carbon atoms of the parent chain as 1, 2, 3, 4 ……etc. Starting from that end which gives the lowest possible number to the carrying the substituent.

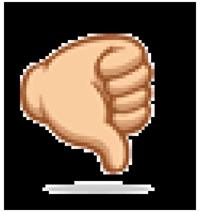
Correct numbering

$$\overset{1}{CH_3}-\overset{\overset{\displaystyle CH_3}{|}}{\overset{2}{CH}}-\overset{3}{CH_2}-\overset{4}{CH_2}-\overset{5}{CH_3}$$

(Contain 5 C atoms)

Wrong numbering

$$\overset{5}{CH_3}-\overset{\overset{\displaystyle CH_3}{|}}{\overset{4}{CH}}-\overset{3}{CH_2}-\overset{2}{CH_2}-\overset{1}{CH_3}$$



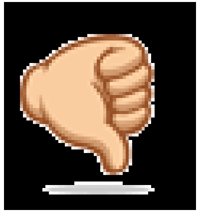
(Contain 5 C atoms)

Rule 3 If the chains of equal length are possible, select the one with the larger number of side chains (substituent).

$$\begin{array}{llllll} CH_3 - & CH - & CH - & CH_2 - & CH_2 - & CH_3 \\ & | & | & & & \\ & CH_3 & CH_2 - CH_3 & & & \end{array}$$

(Contain 6 C atoms
With two alkyl substituent)

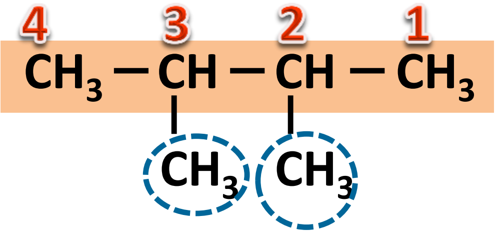
$$\begin{array}{lllll} CH_3 - CH - & CH - & CH_2 - & CH_2 - & CH_3 \\ \quad\quad\;\, | & | & & & \\ \quad\quad CH_3 & CH_2 - CH_3 & & & \end{array}$$



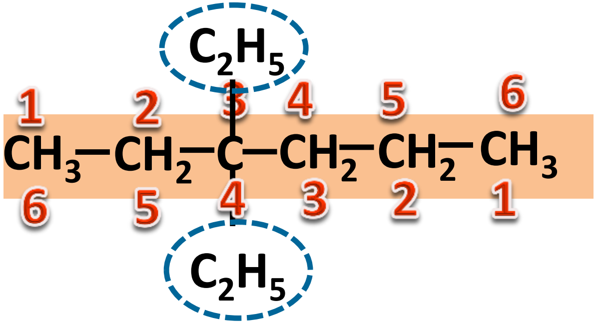
(Contain 6 C atoms
With one alkyl substituent)

Rule 4

If the same substituent or side chain occurs more than once, the prefix Di (for 2), tri (for 3), tetra (for 4), penta (for 5) …….. etc., are attached to the names of the substituents.



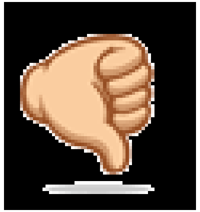
(2, 3 – Dimethylbutane)



(3, 3 – Diethylhexane)

(3,3)
(Correct)

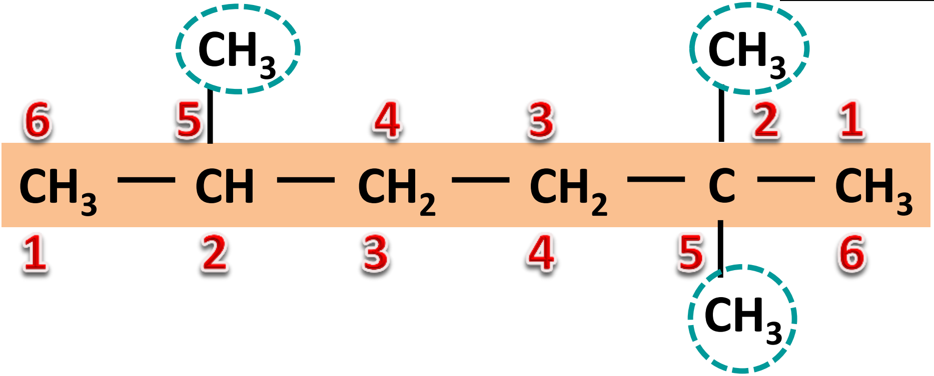
(4,4)
(Wrong)



$3 + 3 = 6$
$4 + 4 = 8$
$6 < 8$

(Correct)

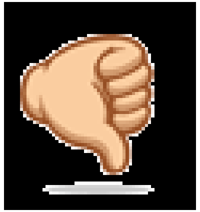
(2,2,5)



(2, 2, 5 – Trimethylhexane)

(2,5,5)

(Wrong)



$2 + 2 + 5 = 9$

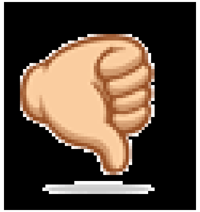
$2 + 5 + 5 = 12$

$9 < 12$

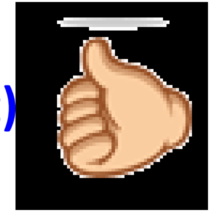
Rule 5 : If two different substituents are located at equivalent position from the two ends of the main chain, then the numbering of the chain is done insuch a way that the alkyl group which come first **in alphabetical order gets the lower number**.

$$\begin{array}{cccccc} 1 & 2 & 3 & 4 & 5 & 6 \\ CH_3 - & CH_2 - & CH - & CH - & CH_2 - & CH_3 \\ 6 & 5 & 4\ | & |\ 3 & 2 & 1 \\ & & CH_3 & C_2H_5 & & \end{array}$$

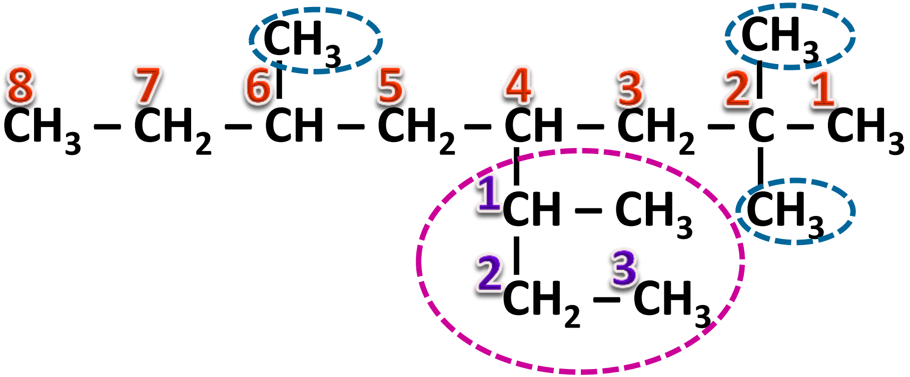
4 – Ethyl – 3 – methylhexane **(Wrong)**



3 – Ethyl – 4 – methylhexane **(Correct)**

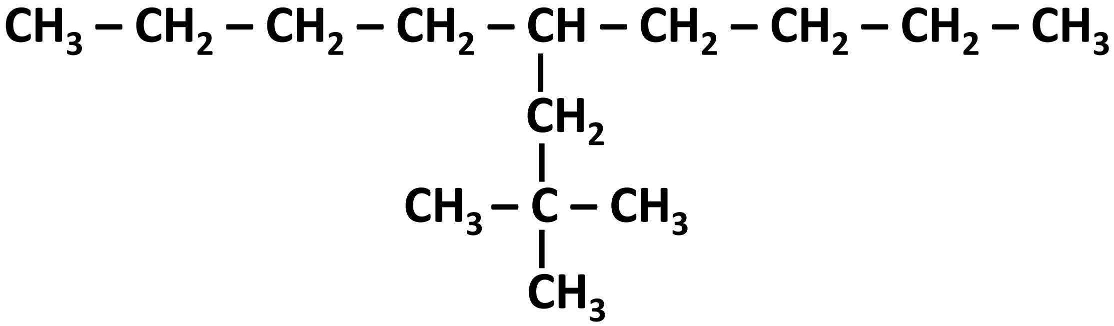


Nomanclature of complex substituents

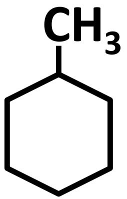


2, 2, 6 –Trimethyl–4 – (1–methylpropyl)octane

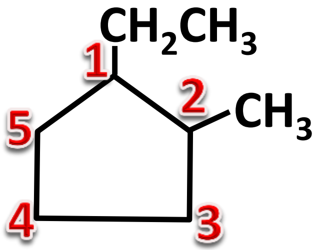
Q. Give the IUPAC name of the following compound



IUPAC Nomanclature of alicyclic compounds

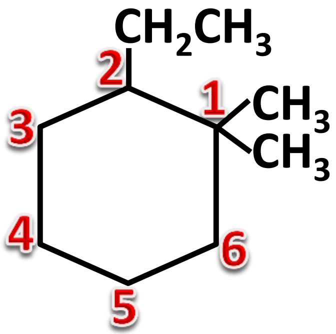


Methylcyclohexane



1–Ethyl –2–methylcyclopentane

IUPAC Nomanclature of alicyclic compounds



2–Ethyl–1, 1–dimethylcyclohexane

Nomenclature of organic compounds having one or more than one functional groups

$$\overset{4}{CH_3} - \overset{3}{CH_2} - \overset{2}{\underset{\underset{OH}{|}}{CH}} - \overset{1}{CH_3}$$

Butan–2–ol

$$\overset{4}{CH_3} - \overset{3}{CH_2} - \overset{2}{\underset{\underset{Cl}{|}}{CH}} - \overset{1}{CH_3}$$

2–Chlorobutane

$$\overset{1}{CH_3} - \underset{\underset{O}{\|}}{\overset{2}{C}} - \overset{3}{CH_2} - \underset{\underset{O}{\|}}{\overset{4}{C}} - \overset{5}{CH_3}$$

Pentane– 2, 4–dione

$$\overset{5}{CH_3} - \overset{4}{CH} = \overset{3}{CH} - \overset{2}{CH} = \overset{1}{CH_2}$$

Penta– 1, 3–diene

Priority for the functional groups

$-COOH > -COOR > -CONH_2 > CN > -CHO > -CO- > -OH > -NH_2 > C=C > C \equiv C$

$$\overset{4}{H_3C} - \overset{3}{CH} = \overset{2}{CH} - \overset{1}{CHO}$$

But–2–enal

Structure	Name
$\overset{3}{H_3C} - \overset{2}{CH}(OH) - \overset{1}{COOH}$	2–Hydroxypropanoic acid
$\overset{1}{H_2C} = \overset{2}{CH} - \overset{3}{C} \equiv \overset{4}{C} - \overset{5}{CH_3}$	Pent–1–en–3–yne
$\overset{1}{H_3C} - \overset{2}{C}(OH) = \overset{3}{C}(NH_2) - \overset{4}{CH_3}$	3–Aminobut–2–en–2–ol

Priority for the functional groups

$-COOH > -COOR > -CONH_2 > CN > -CHO > -CO- > -OH > -NH_2 > C=C > C \equiv C$

Priority for the functional groups

$-COOH > -COOR > -CONH_2 > CN > -CHO > -CO- > -OH > -NH_2 > C=C > C\equiv C$

Q. Give the IUPAC name of the following compounds

1)

$$\overset{5}{H_3C}-\underset{\underset{O}{\|}}{\overset{4}{C}}-\overset{3}{CH_2}-\overset{2}{CH_2}-\overset{1}{COOH}$$

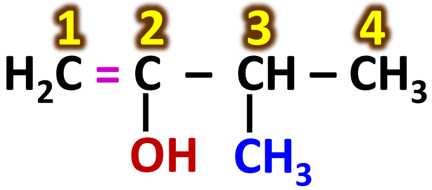
4–Oxopentanoic acid

Priority for the functional groups

$-COOH > -COOR > -CONH_2 > CN > -CHO > -CO- > -OH > -NH_2 > C=C > C\equiv C$

Q. Give the IUPAC name of the following compounds

2)



3–Methylbut–1–en–2–ol

ISOMERISM AND ITS CLASSIFICATION

ISOMERISM

CLASSIFICATION OF ISOMERISM

The compounds which are having same molecular formula but differ in structures are known as ISOMERS.

Structural isomerism

- Chain isomerism
- Position isomerism
- Functional isomerism
- Metamerism
- Tautomerism

Stereo isomerism

- Conformational
- Configurationally
  - Geometrical
    - Cis isomerism
    - Trans isomerism
  - Optical

Isomerism

(a) Chain isomerism

Compounds having same molecular formula but differ in the nature of carbon chain are known as chain isomers and the phenomenon is known as *chain isomerism*.

Examples are

(i) C_4H_{10}; $\quad CH_2CH_2CH_2CH_3$ **and** $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_3$

n - Butane $\quad$ **Iso-butane**

(a) Chain isomerism

(ii) C_4H_8O; $CH_3CH_2\,CH_2CHO$ **and**

$$\begin{array}{ccccc} CH_3 & - & CH & - & CHO \\ & & | & & \\ & & CH_3 & & \end{array}$$

Butanal

2- Methylpropanal

(b) Position isomerism

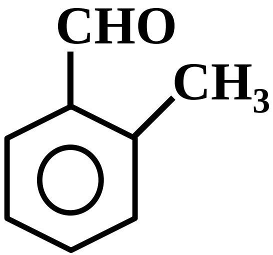
Compounds having same molecular formula but differ in the position of substituents or multiple bond or functional groups are known as position isomers and the phenomenon is known as *position isomerism*.

Examples are

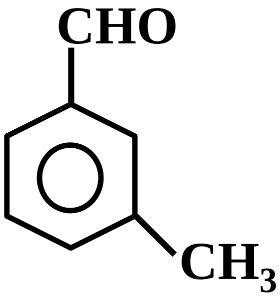
(i) C_4H_8; $CH_3CH_2CH{=}CH_2$, $CH_3 - CH = CH - CH_3$

1- Butene **2-butene**

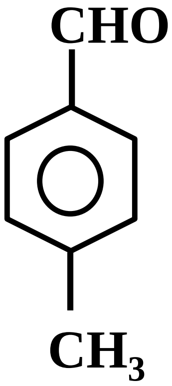
(b) Position isomerism



2- Methyl benzaldehyde
or
0- Tolualdehyde



3- Methyl benzaldehyde
or
m- Tolualdehyde



4- Methyl benzaldehyde
or
p- Tolualdehyde

(c) Functional isomerism:

Compounds having same molecular formula but differ in the nature of functional groups are known as functional isomers and the phenomenon is known as *functional isomerism*.

Examples are

C_3H_6O; Acyclic isomers:

(i) CH_3CH_2CHO

Propanal

(ii) $CH_3-\overset{\overset{\large O}{\|}}{C}-CH_3$

Propanone

(c) Functional isomerism:

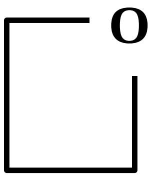
(iii) $CH_2 = CHCH_2OH$

Prop-2-en-1-ol

(iv) $H_2C = CH - O\,CH_3$

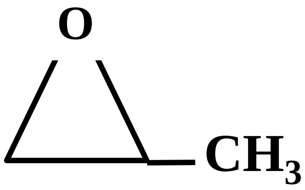
Methoxyethene

Cyclic isomers:

(v) 

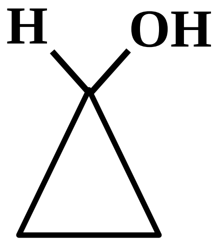
Oxetane

(1,3- Epoxy propane)

(vi) 

2- methyl oxirane

(1,2- Epoxy propane)

(vii) 

Cyclopropanol

(d) Metamerism

Compounds having same molecular formula but differ in the nature of alkyl groups attached to the same functional group are known as metamers and the phenomenon is known as *metamerism*.

Examples are

$C_4H_{10}O$; $CH_3\,CH_2-O-CH_2CH_3$, $CH_3-O-CH_2CH_2CH_3$

EthoxyEthane **MethoxyEthane**

(d) Metamerism

$C_5H_{10}O$; $CH_3CH_2-\overset{\overset{\displaystyle O}{\|}}{C}-CH_2CH_3$ and $CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-CH_2CH_2CH_3$

Pentan-3-one　　　Pentan-2-one

Compounds having $-O-$, $-S-$, $-\overset{\overset{\displaystyle O}{\|}}{C}-$, $-NH-$, $-\overset{\overset{\displaystyle O}{\|}}{C}-O-$ Functional groups only exhibit metamerism.

(e) Tautomerism

The phenomenon of reversible inter conversion of isomers due to the migration of α - hydrogen is known as *tautomerism*.

Examples are

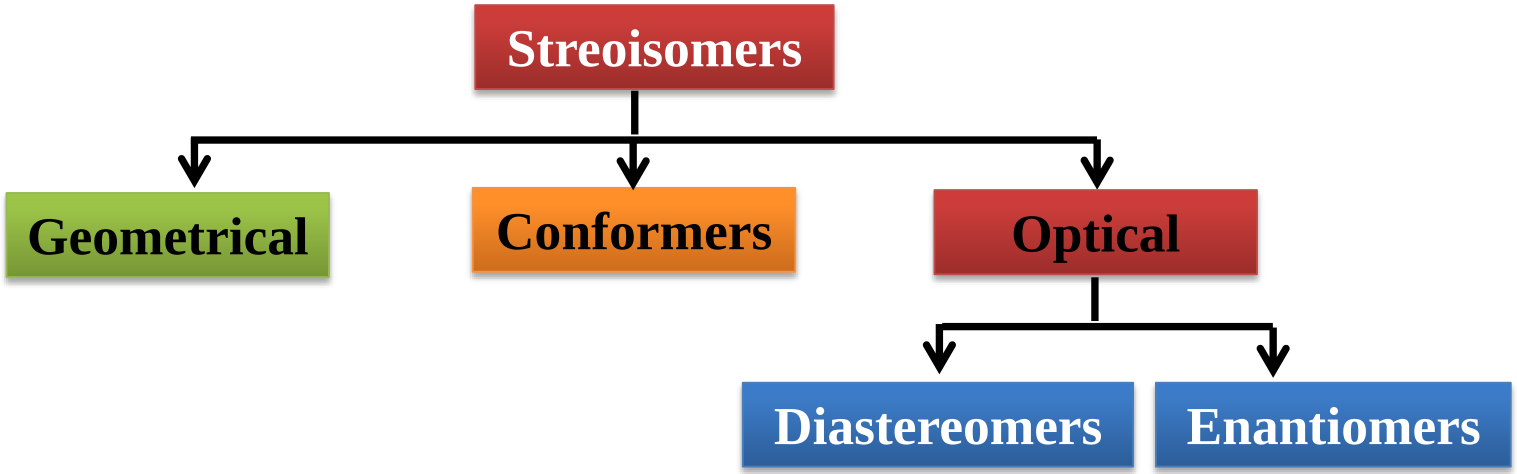
Aldehydes and ketones show tautomerism. For example

$$(C_2H_4O);\quad CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-H \;\Leftrightarrow\; CH_2=\overset{\overset{\displaystyle OH}{|}}{CH}$$

Acetaldehyde **Vinyl alcohol**

STREOISOMERS

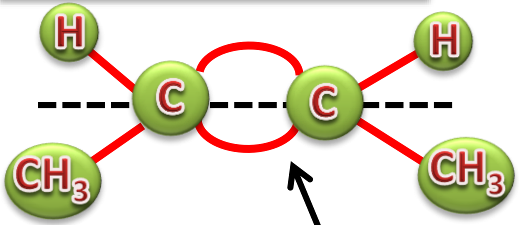
- Isomers having same molecular formula but differing in 3 dimensional orientation of their atoms in a space are called stereoisomers and the phenomenon is known as ***stereoisomerism***.



Geometrical isomerism

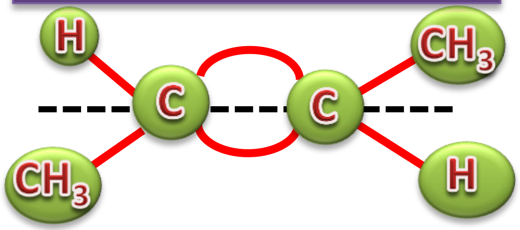
➢ **It describes the relative orientation of functional group within a molecule. It is also called *cis-trans isomerism.***

1) Cis – isomer :-



The isomers in which two identical atoms or groups lie on the same side of the double bond is called **Cis-isomer.**

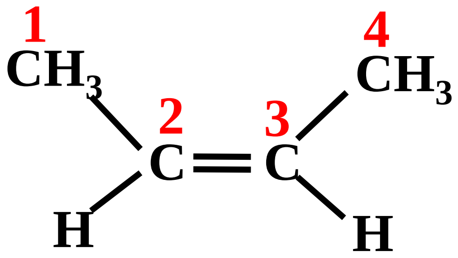
2) Trans – isomer :-



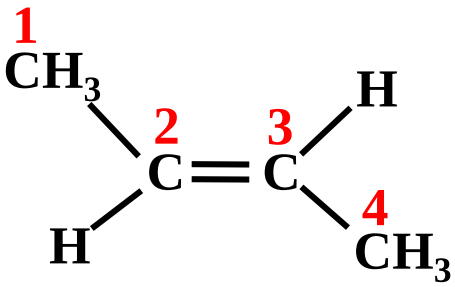
The isomers in which two identical atoms or groups lie on the OPPOSITE side of the double bond is called **Trans**-isomer.

Geometrical isomerism

E.g



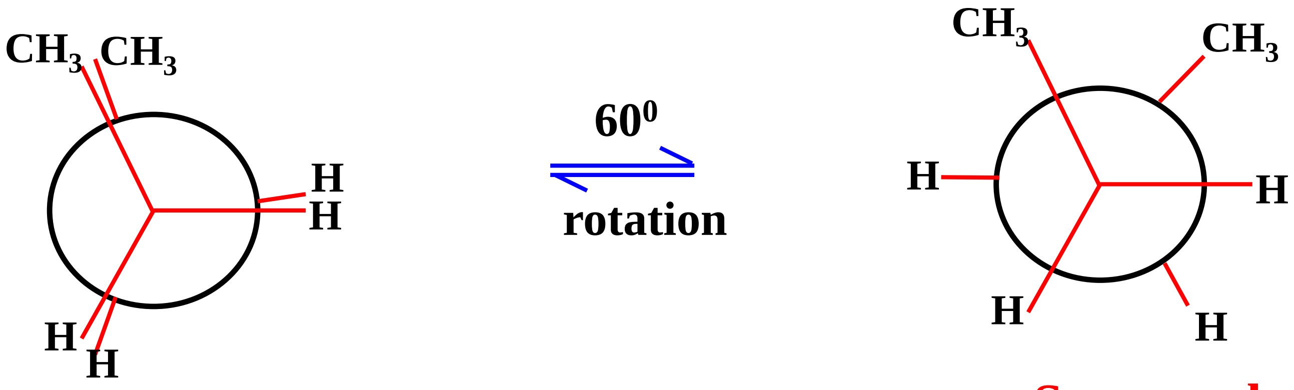
cis -But-2-ene



trans -But-2-ene

Conformers

- A form of stereoisomerism in which the isomers can be **interconverted** exclusively by **rotation** about C–C single bonds. These are also called ***rotamers.***



Eclipsed

Staggered

Conformations:-[Rotamers]

- These isomers are formed by the **rotation** of C – C sigma (σ) bonds.
- Alkanes can have **infinite** number of conformations.
- The rotation around a C – C single bond is not completely free.
- It is hindered by a small energy barrier of 1-20 kJ/mole, due to **weak repulsive interaction** between the adjacent bonds.
- This repulsive interaction is called **torsional strain**.

Conformations of ethane:

- **Ethane (C_2H_6) molecule contains a C – C single bond with each carbon atom attached to three hydrogen atoms.**

- **Keep one carbon atom stationary and rotate the other carbon atom around the C – C axis.**

- **This rotation results into infinite number of conformations.**

Conformations of ethane:

- However, there are two extreme cases. One such conformations in which hydrogen atoms attached to two carbons are as closed together as much as possible is called **eclipsed conformation.**

- Other in which hydrogen are as far apart as possible is known as **staggered conformation.**

Eclipsed and staggered conformations can be represented by **Sawhorse** & **Newmann** projections

Newmann projections

- The molecule is viewed at the C – C bond head on.
- The carbon atom nearer to the eye is represented by a point.
- The rear carbon atom(the carbon atom away from the eye) is represented by a circle.
- The lines radiating from the center of the circle denotes the bonds of the carbon closest to us.

Newmann projections

- Those lines radiating from the circumference (out side) denote the bonds of the carbon farthest form us.

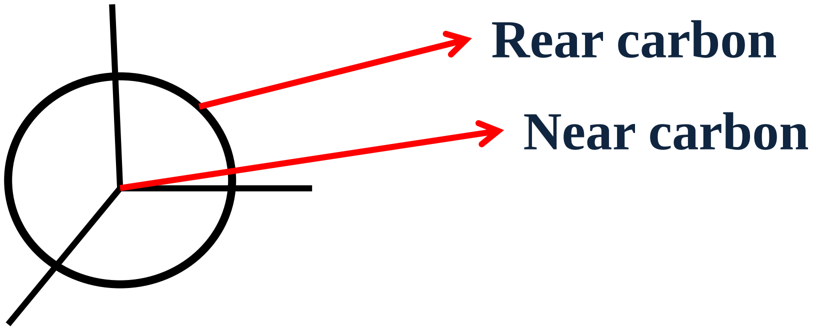
- In staggered form distance between the H- Nuclei is 2.55 A^0.

- In eclipsed form distance between the H- Nuclei is 2.29 A^0.

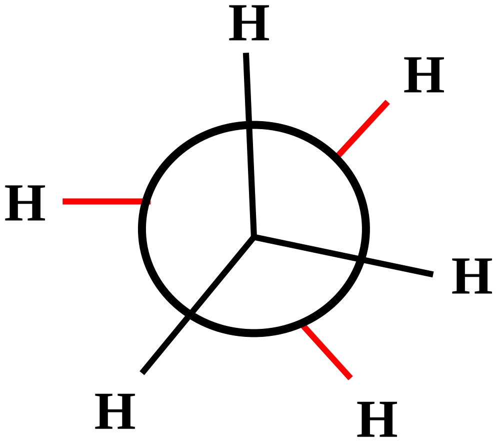
- Dihedral angle in eclipsed form = 0^0.

Newmann projections

- Dihedral angle in staggered form = 180^0

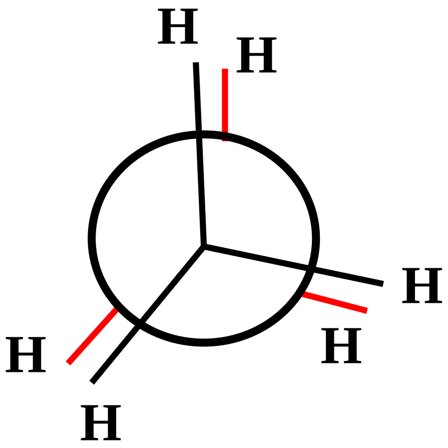


Newmann projections



Staggered conformation

Newmann projections



Eclipsed conformation

➢ **Remaining conformations are called skew conformations.**

Make a note:

Apart from eclipsed and staggeed, the remains conformations are called **skew conformations**.

Relative stability of conformations

- Staggered conformation > skew conformation > eclipsed conformation.
- In eclipsed conformation, bonds are very close & have maximum repulsions.
- In staggered conformation, bonds are at maximum distance & have minimum repulsions.

Optical Isomerism :

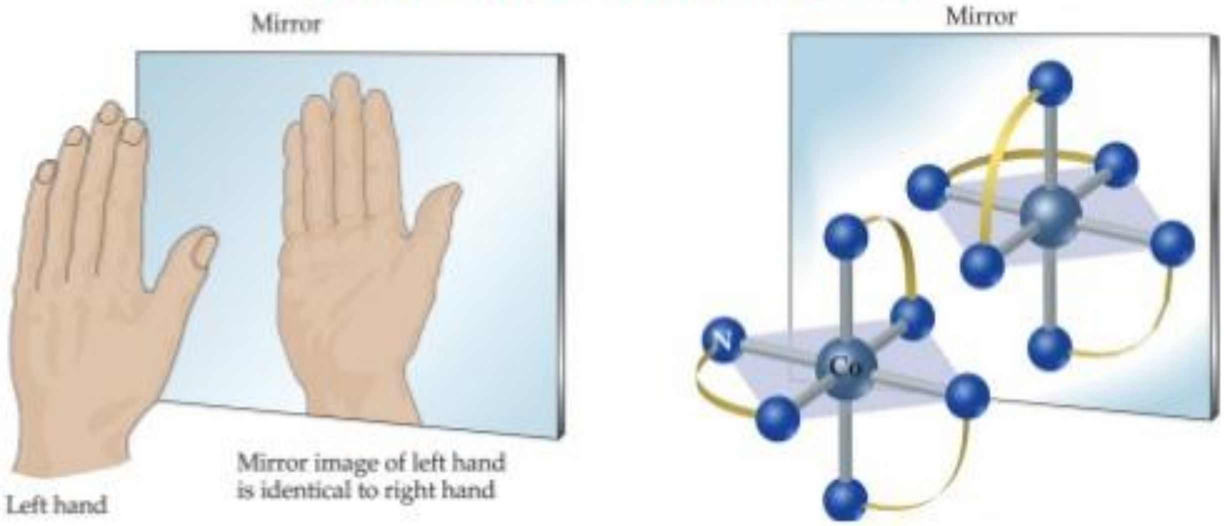
Optical Isomers:

The isomers that rotate plane polarised light are called *optical isomers*

- **Optical isomers that are mirror images and are non superimposable are called enantiomers.**

- **A molecule or ion that exists as a pair of enantiomers is said to be optically active and are said to exhibit optical isomerism.**

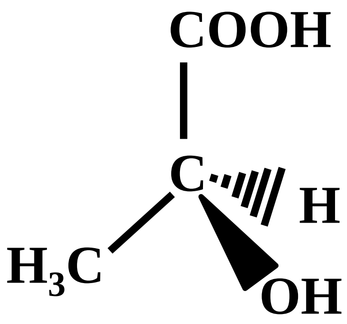
Stereoisomers



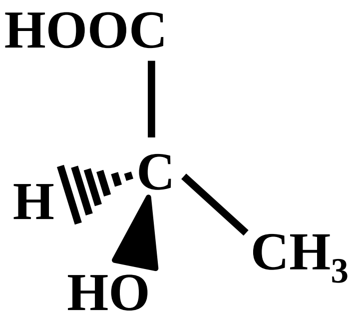
Enantiomers

- It is one of the two stereoisomers that are mirror image of each other and non super imposable are called *enantiomers*.

e.g:



(R)-(+)-lactic acid

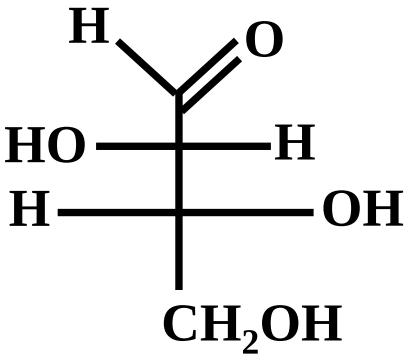


(S)-(–)-lactic acid

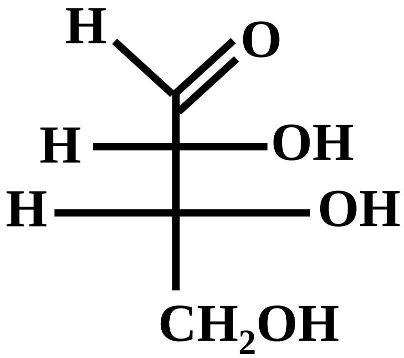
Diastereomers

- Stereoisomers that are non-mirror images and non-superimposable are called ***Diasteroisomers.***

e.g:



D- Threose



D- Erythrose

REACTION MECHANISM

Reaction mechanism

BOND FISSION

Breaking of a covalent bond is called bond fission.

They are of 2 types.

HOMOLYTIC FISSION (HOMOLYSIS)

i) Breaking of a covalent bond in such a way that both the atoms or species retain one electron each.

Reaction mechanism

BOND FISSION

Breaking of a covalent bond is called bond fission.
They are of 2 types.

HOMOLYTIC FISSION (HOMOLYSIS)

ii) Fission takes place in a symmetrical manner

$$A - A \xrightarrow{\text{U.V.light}} \overset{\bullet}{A} + \overset{\bullet}{A}$$

eg : $$CH_3 - CH_3 \xrightarrow{\text{U.V.light}} {}^{\bullet}CH_3 + {}^{\bullet}CH_3$$

Methyl free radicals

Reaction mechanism

BOND FISSION

Breaking of a covalent bond is called **bond fission.**

They are of 2 types.

HOMOLYTIC FISSION (HOMOLYSIS)

iii) It results in formation of **free radicals, Short lived, unstable and highly reactive species.**

iv) Takes place **in the presence of UV light, hightemp,peroxide or sunlight.**

Reaction mechanism

BOND FISSION

HETEROLYTIC FISSION [HETEROLYSIS]

i) Breaking of a covalent bond in such a way that one of the atom or species retains a Pair of electrons.

ii) Fission takes place in unsymmetrical manner

$$A{-}B \xrightarrow[\text{Solvent}]{\text{Polar}} A^{+} + B^{-}$$

$$A{-}B \xrightarrow[\text{Solvent}]{\text{Polar}} A^{-} + B^{+}$$

$\Rightarrow$ Depending upon electronegativity

Reaction mechanism

BOND FISSION

HETEROLYTIC FISSION [HETEROLYSIS]

iii) It results in **formation of ions. (i.e., cations and anions)**

Homolytic Fission	Heterolytic Fission
In this case, the covalent bond breaks symmetrically	In this case, the covalent bond breaks unsymmetrically

Homolytic Fission	Heterolytic Fission
Each species obtains and retains one electron from shared electron pair	The more electronegative atom retains the shared electron pair

Homolytic Fission	Heterolytic Fission
Electrically neutral free radicals are formed which carry an odd electron.	Electrically charged ions (cations and anions) are formed

Homolytic Fission	Heterolytic Fission
It takes place in the presence of sunlight, U.V. light.	It takes place in the presence of polar solvent.

REAGENTS

Electrophilic Reagents

- These are electron loving species.
- These are electron deficient species.
- They attack the site of high electron density in the substrate.
- They may be + vely charged ions (cations) or neutral molecules
- They possess an atom with incomplete octet.

Electrophilic Reagents

- They are **Lewis acids.**
- They **accept** an electron pair from the substrate to form a covalent bond.

e.g.: H^+, NO_2^+, BF_3, $AlCl_3$, etc.

Nucleophilic Reagents

- These are **nucleus loving** species.
- These are **electron rich** species.
- They attack the site of **low** electron density in the substrate.
- They may be **negatively charged ions (anions)** or neutral molecules.
- They possess an atom with **lone pair of electrons.**

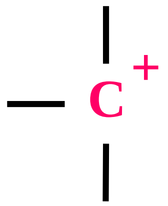
Nucleophilic Reagents

- **They are Lewis bases.**
- **They donate an electron pair to substrate and forms a co-ordinate covalent bond(dative bond).**

e.g.: OH^{-} , CN^{-} , $H-\ddot{\underset{..}{O}}-H$, $\ddot{N}H_3$, etc.

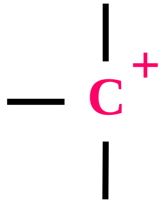
REACTION INTERMEDIATES

Carbonium Ion (Carbocation)



- **Carbon atom is positively charged**
- **Electron deficient species**
- **Carbon atom posesses six electrons in its outermost shell.**
- **sp^2 hybridisation.**
- **Its shape is triangular planar.**

Carbonium Ion (Carbocation)



Stability of carbonium ion :

$$\underset{\text{tert}}{(CH_3)_3\overset{+}{C}} > \underset{\text{Sec}}{(CH_3)_2\overset{+}{C}H} > \underset{\text{pri.}}{CH_3\overset{+}{C}H_2} > \underset{\text{methyl}}{\overset{+}{C}H_3}$$

- It can **accept** an electron pair from a nucleophile to form a covalent bond.
- It is a **Lewis acid**

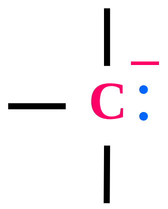
e.g.: tert-butyl carbocation $(CH_3)_3\ C^+$

General stability of order of carbocation

- Tricyclopropyl carbocation > di cyclopropyl carbocation > tropylium ion > triphenyl carbocation > di phenyl carbocation > phenyl carbocation > $CH_2 = CH - \overset{+}{C}H_2 >$

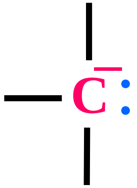
  $R_3\overset{+}{C} > R_2\overset{+}{C}H > R\overset{+}{C}H_2 > \overset{+}{C}H_3 > CH_2 = \overset{+}{C}H$

Carbanion



- Carbon atom is negatively charged.
- Electron rich species.
- Carbon atom possesses eight electrons in its outermost shell.
- sp^3 hybridization and carries a lone pair of electrons.
- Its shape is pyramidal.

Carbanion



- It can **donate** an electron pair to an electrophile to form a covalent bond.
- It is a **Lewis base.**

e.g.: Methyl carbanion $\bar{C}H_3$

Stability of carbanion:

(i) $(CH_3)_3\bar{C} < (CH_3)_2\bar{C}H < CH_3\bar{C}H_2 < \bar{C}H_3$

Stability of order of different carbanions

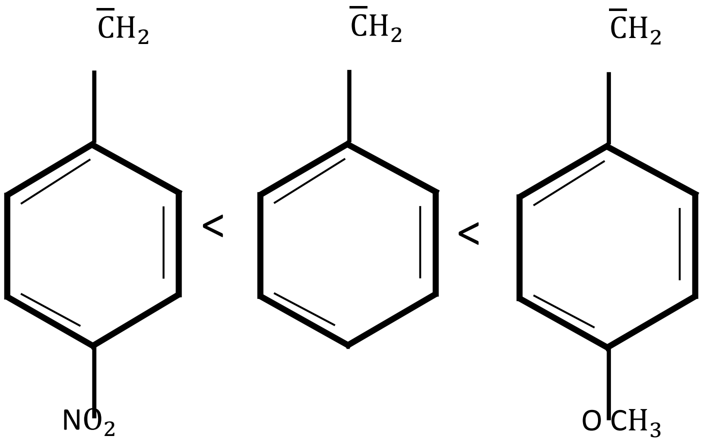
(ii) $\mathbf{H - C \equiv \bar{C} > H_2C = \bar{C}H > H_3C - \bar{C}H_2}$

(iii) Allyl and bezyl carbanions though primary are more stable than simple priamary alkyl carbanions due to resonance.

$$\mathbf{H_2C = CH - \bar{C}H_2 \leftrightarrow H_2\bar{C} - CH = CH_2}$$

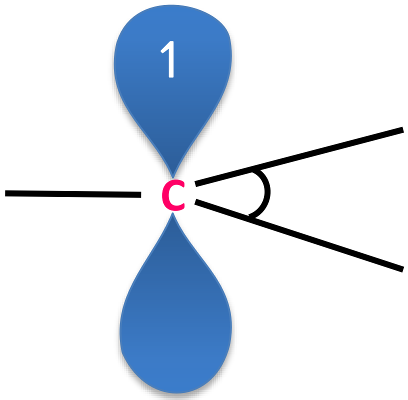
(iv) $\boldsymbol{C_6H_5 - \bar{C}H_2 < (C_6H_5)_2 - \bar{C}H < (C_6H_5)_3 - \bar{C}}$

(v)



CARBON FREE RADICAL

- **The species having trivalent carbon atom bearing no charge and having odd electron or unpaired electron is known as free radical**
- **Free radicals are highly reactive species due to the presence of odd or unpaired electron.**
- **Free radicals are electron deficient species hence considered to be neutral electrophiles.**
- **In methyl free radical carbon undergoes SP^2 hybridisation**



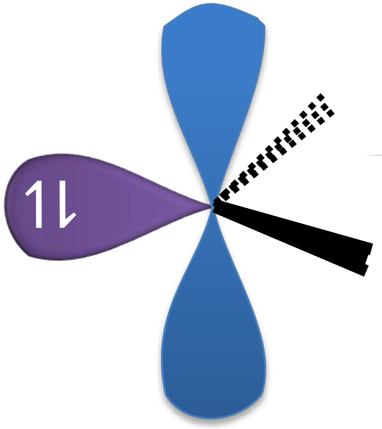
Stability of free radicals.

- **Triphenyl methyl > Benzyl > Allyl > 3^0> 2^0>1^0> methyl > vinyl**

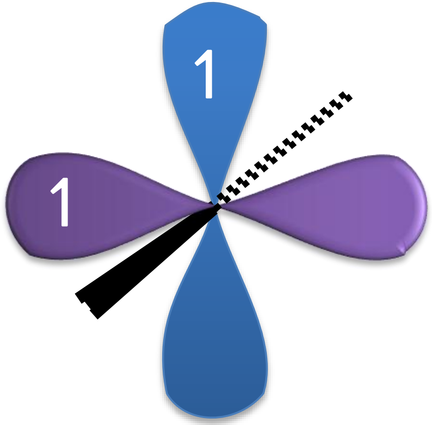
- $(C_6H_5)_3\dot{C} > (C_6H_5)_2\dot{C}H > C_6H_5\dot{C}H_2 > CH_2 = CH\text{-}\dot{C}H_2 > R_3\dot{C} > R_2\dot{C}H > R\dot{C}H_2 > \dot{C}H_3 > H_2C = \dot{C}H$

CARBENES

- Singlet carbene has two non-bonding electrons are paired and present in the same orbital (sp^2 hybridisation).
- It is planar and angular
- Triplet carbene has two non-bonding electrons in different orbitals.
- Triplet carbene is also called biradical or bivalent free radical
- Triplet carbene is sp hybridised and its shape is angular.



Singlet



triplet

- In general, a triplet carbene is relatively more stable than singlet carbene.

ELECTRON DISPLACEMENT EFFECTS

ELECTRON DISPLACEMENT EFFECTS

INDUCTIVE EFFECT :

It involves the dsiplacement of electrons in a single covalent bond [σ electrons are involved]

ELECTRON DISPLACEMENT EFFECTS **INDUCTIVE EFFECT :**

- **The permanent polarisation of a single covalent bond, due to the displacement of electrons towards the more electronegative atom, due to difference in electronegativity is known as inductive effect.**

- **It is a permanent effect.**

ELECTRON DISPLACEMENT EFFECTS

Reaction mechanism

- **Inductive effect decreases with distance. [operates over short distance]**

$$\overset{\delta_3+}{C} — \overset{\delta_2+}{C} — \overset{\delta_1+}{C} — \overset{\delta\,-}{Cl} \qquad [\delta_3 < \delta_2 < \delta_1]$$

ELECTRON DISPLACEMENT EFFECTS

Inductive effect is of 2 types

1) + I(Effect) : Electron releasing groups (R-groups)

$-C_2H_5$, $-CH(CH_3)_2$, $-CH_3$, etc

2) - I (Effect) : Electron withdrawing groups. (Functional groups)

$-NO_2$, $-X$, $-CN$, $-COOH$, $-OH$, $-NH_2$, etc

Applications of inductive effect: **It explains the stability of carbonium ion , free radicals, acidic nature of carboxylic acids & basic nature of amines.**

The decreasing order of +I effect is

$$-\mathbf{O}^{-} > -\mathbf{COO}^{-} > (\mathbf{CH_3})_3\mathbf{C}- > (\mathbf{CH_3})_2\mathbf{CH}- > CH_3CH_2CH_2- > CH_3CH_2- > CH_3$$

$$-\mathbf{NR}^{-} > \mathbf{O}^{-}$$

$$-\mathbf{Se}^{-} > \mathbf{S}^{-} > \mathbf{O}^{-}$$

The decreasing order of -I effect is

$\mathbf{NH_3{>}NO_2{>}CN{>}SO_3H{>}CHO{>}CO{>}COOH{>}COCl{>}COOR{>}CONH_2{>}X}$

$\mathbf{> -OH > -OR > -NH_2 > -C_6H_5 > -H}$

F>Cl>Br>I

$\mathbf{F > -OR > -NR_2 > -CH_3}$

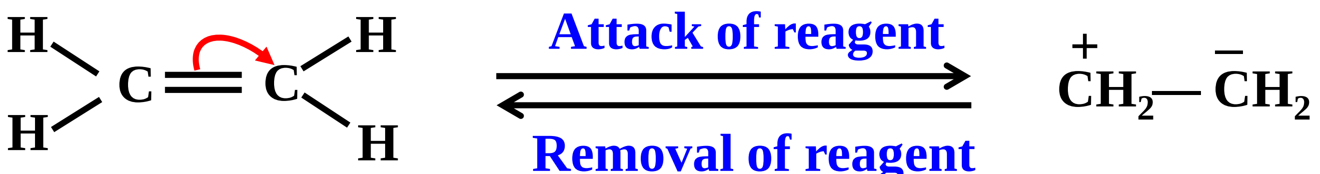
ELECTRON DISPLACEMENT EFFECTS

ELECTROMERIC EFFECT :

- Explains the displacement of electrons in **multiple bonds.** [double bond or triple bond]
- The complete transfer of a pair of electrons towards one of the atoms in the presence of **attacking reagent** is known as **electromeric effect.**
- It is a **temporary** effect.
- Its effect operates **over a long distance.**

ELECTRON DISPLACEMENT EFFECTS

ELECTROMERIC EFFECT :



Ethene

INDUCTIVE EFFECT	ELECTROMERIC EFFECT
It is permanent in nature.	It is temporary in nature. If the attacking reagent is withdrawn, the original situation is restored.
It is due to the presence of electronegative atom in the molecule itself.	It is due to the approach of the attacking reagent.
It is the mobility of electrons along C-C single bond (Sigma bond).	It is the mobility of electrons in a multiple bond (double or triple bond).

INDUCTIVE EFFECT	ELECTROMERIC EFFECT
It is due to the mobility of Sigma (σ) electrons.	It is due to the mobility of Pi (π) electrons.
This effect becomes negligible after 2nd carbon atom in the chain.	This effect can be relayed through a longer distance in the chain due to conjugation of double bonds.
In this case, the displaced electron pair does not leave its valence shell.	In this case the displaced electron pair leaves its valence shell.

INDUCTIVE EFFECT	ELECTROMERIC EFFECT
This involves partial transfer of σ- electrons.	This involves complete transfer of π - electrons.
In this effect, partial charges are developed on atoms and no ions are formed.	In this effect, complete charges are developed on atoms and ions are formed.
It is represented by "I".	It is represented by "E" .

1. Homolytic fission takes place in ___ manner

1) Symmetrical

2) Unsymmetrical

3) Both a and b

4) Can’t say

MCQs

Answer

2. In carbocation, carbon is ________hybridised.

1) sp^3

2) sp^2

3) sp

4) sp^3d

Answer

3. Inductive effect is ___

1) Temporary

2) Permanent

3) Both a and b

4) Can’t say

Answer

4. Which one of the following, electrophile is________

1) BF_3

2) H_2O

3) NH_3

4) CN^-

Answer

5. Nucleophiles are ___

1) Lewis acid

2) Lewis bases

3) Both a and b

4) None of these

Answer

RESONANCE AND HYPER CONJUGATION

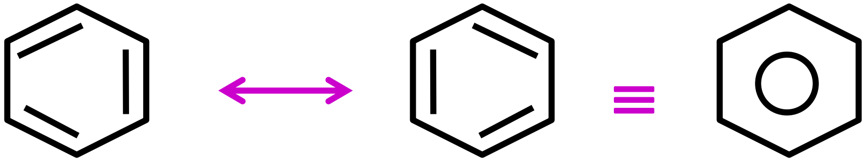
Resonance

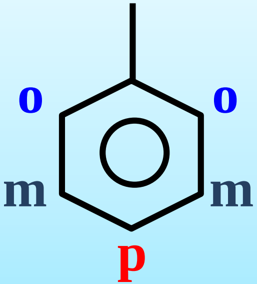
- **The phenomenon in which two or more equivalent structures for a compound can be written that involves identical position of atoms but different arrangements of the electrons, is called as resonance.**

- **The structures are called as resonating structures or canonical structures**

Resonance

Resonating structures of Benzene





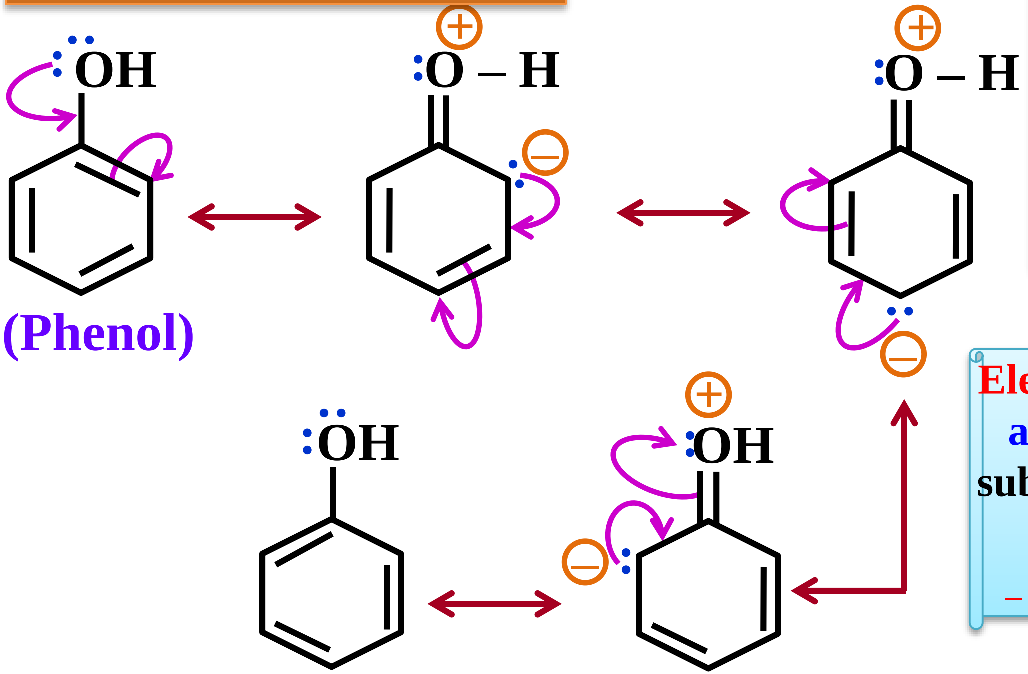
o : ortho

m : meta

p : para

Directive influence of a functional group in monosubstituted Benzene

Positive (+) Resonance



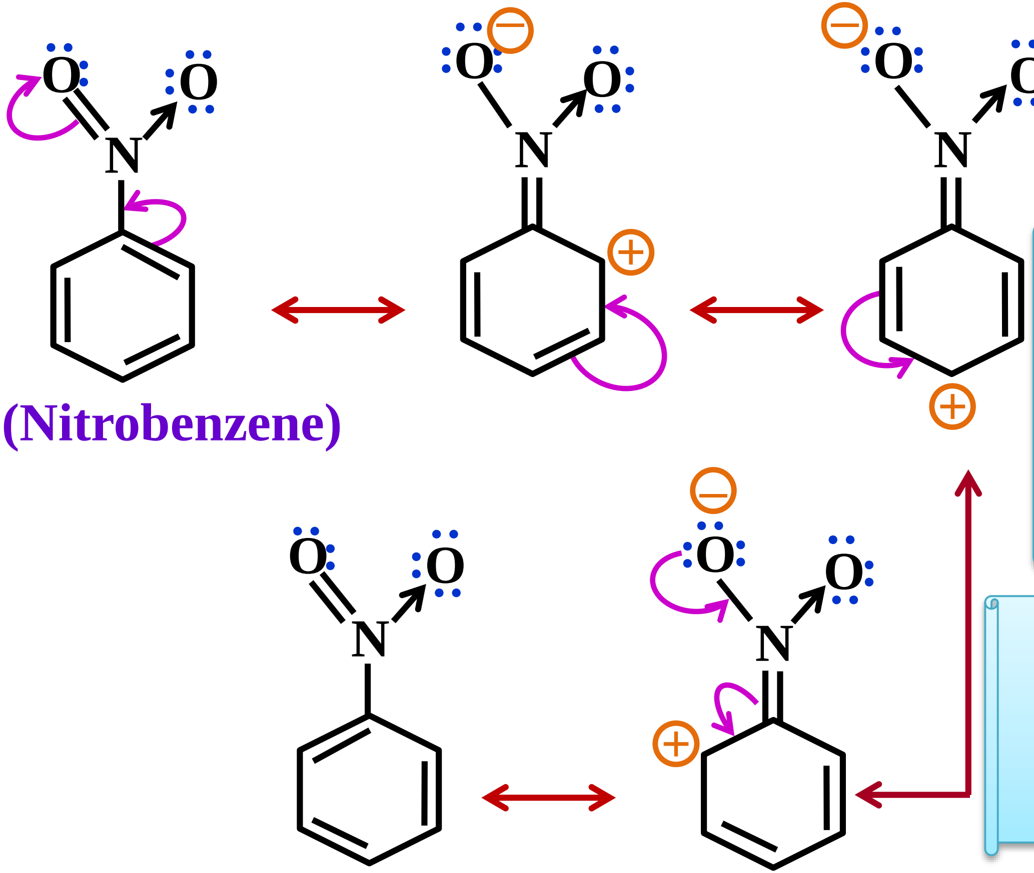
(Phenol)

When the transfer of electrons is away from an atom or substituent group attached to the conjugated system, it is termed as positive resonance effect.

Electrophile (positively charged species)will attack on ortho and para positions when substituent on Benzene is Electron donating groups such as

$-NH_2$, $-OH$, $-NHR$, $-NHCOCH_3$, $-OCH_3$, $-R$, etc.

Negative (–) Resonance



(Nitrobenzene)

Electrophile will attack only on metaposition, when substituent on benzene is electron withdrawing group such as

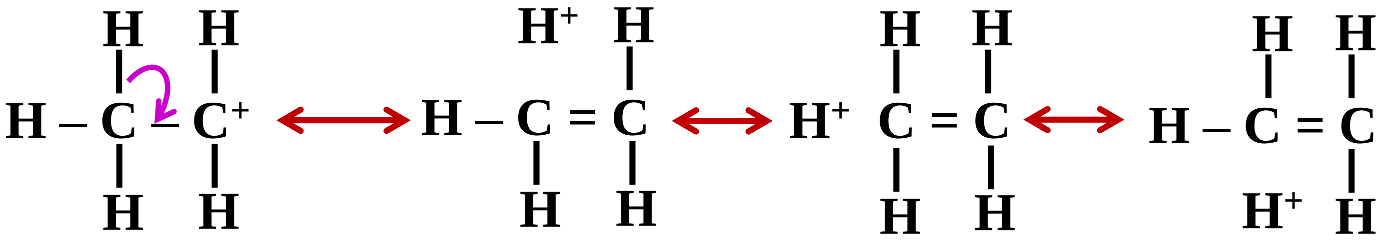
– NO_2 , – CN, – CHO, – COOH, – SO_3H, – COOR, etc.

When the transfer of electrons is towards the atom or substituent group attached to the conjugated system, it is termed as negative resonance effect.

Hyperconjugation

The delocalization σ bonding electrons of α C-H bond towards unsaturation is known as *Hyperconjugation*.

e.g.



(Ethyl carbocation)

Applications of Hyperconjugation:

It explains the stability of carbocation, free radicals & alkenes.

1. The delocalization of electrons due to overlap between p-orbital and sigma bond is called as ____

MCQs

Answer

a) Resonance

b) Hyper conjugation

c) No bond resonance

d) Both b or c

2. From the following, electron donating group is ____

Answer

a) NO_2

b) NH_2

c) alkyl

d) both b or c

3. From the following, electron withdrawing group is ____

Answer

a) NO_2

b) NH_2

c) alkyl

d) OH

4. In electrophilic substitution reaction of nitrobenzene, electrophile will attack on ___ position..

Answer

a) Ortho

b) Meta

c) Para

d) Ortho and para

REAGENTS

Electrophilic Reagents

- These are electron loving species.
- These are electron deficient species.
- They attack the site of high electron density in the substrate.
- They may be + vely charged ions (cations) or neutral molecules
- They possess an atom with incomplete octet.

Electrophilic Reagents

- They are **Lewis acids.**
- They **accept** an electron pair from the substrate to form a covalent bond.

e.g.: H^+, $\overset{+}{N}O_2$, BF_3, $AlCl_3$, etc.

Nucleophilic Reagents

- These are nucleus loving species.
- These are electron rich species.
- They attack the site of low electron density in the substrate.
- They may be negatively charged ions (anions) or neutral molecules.
- They possess an atom with lone pair of electrons.

Nucleophilic Reagents

- They are **Lewis bases.**
- They **donate** an electron pair to substrate and forms a co-ordinate covalent bond(dative bond).

e.g.: OH^- , CN^- , $H - \ddot{O} - H$, NH_3 , etc.

CRITERIA OF PURITY OF ORGANIC COMPOUNDS

CRITERIA OF PURITY

PURITY

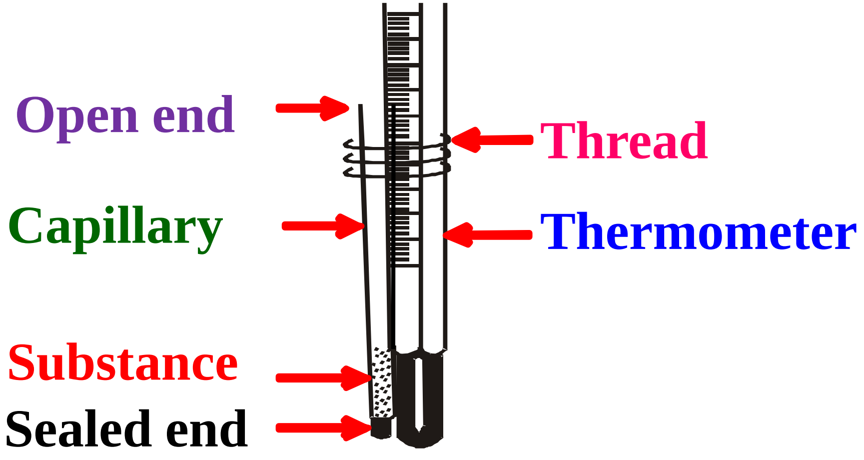
Boiling Point | **Melting Point**

Pure solid → **Melts at definite temperature**

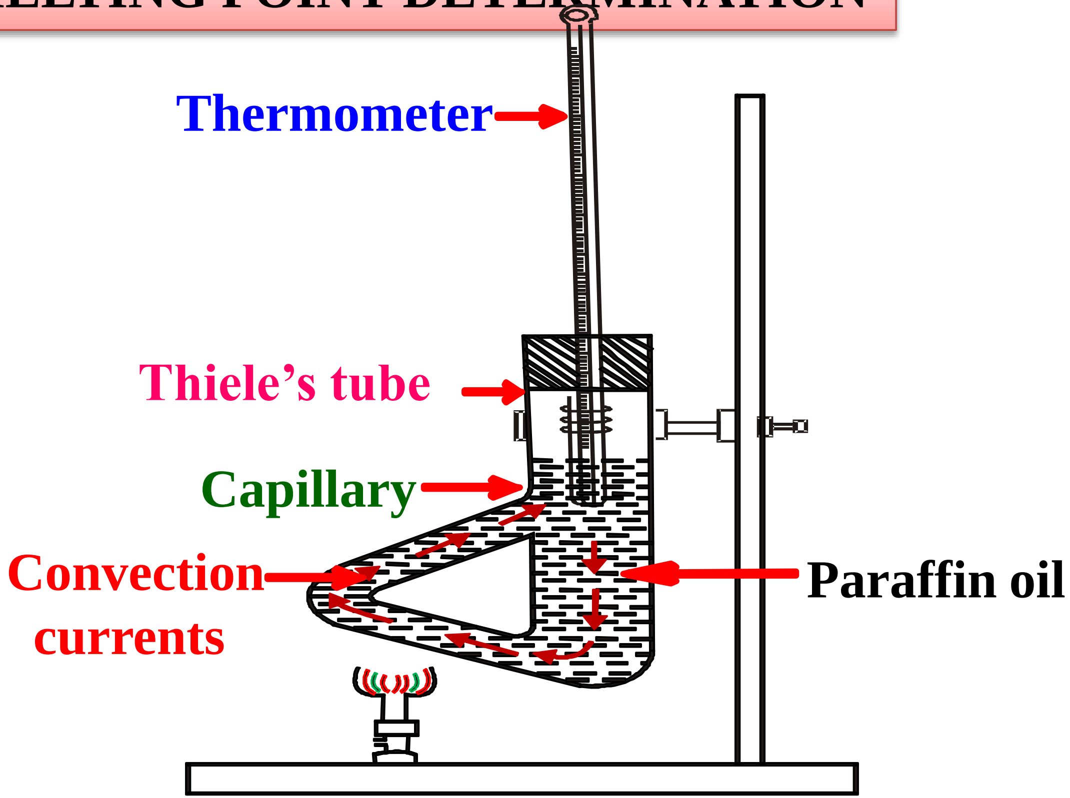
Pure liquid → **has definite boiling point**

MELTING POINT DETERMINATION

Melting Point of a solid **: "The temperature at which a solid changes into its melt (liquid form)."**

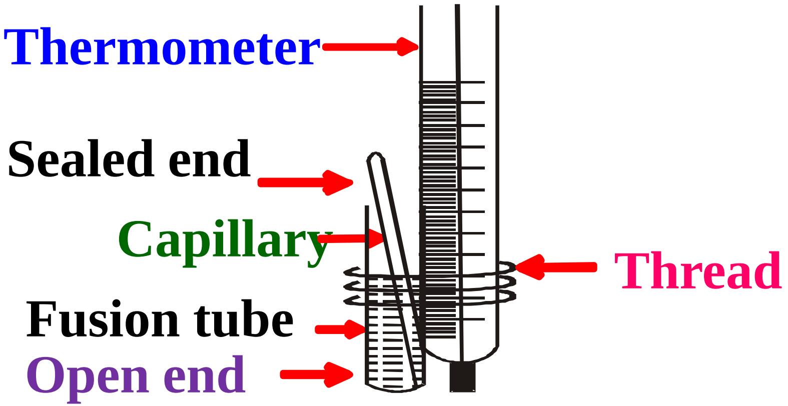


MELTING POINT DETERMINATION

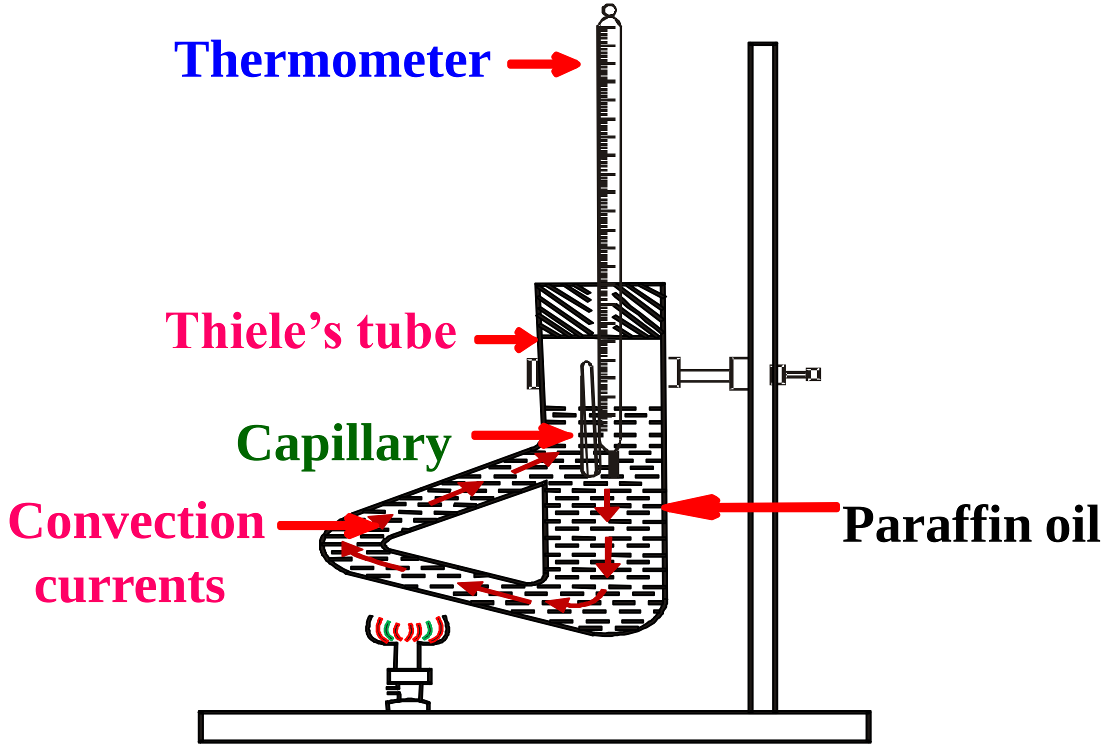


DETERMINATION OF BOILING POINT OF A LIQUID

Boiling Point of a liquid : **"The temperature at which the vapour pressure of the liquid becomes equal to the atmospheric pressure."**



DETERMINATION OF BOILING POINT OF A LIQUID



METHODS OF PURIFICATION OF ORGANIC COMPOUNDS

Methods of Purification

- Sublimation
- Crystallization

Solids

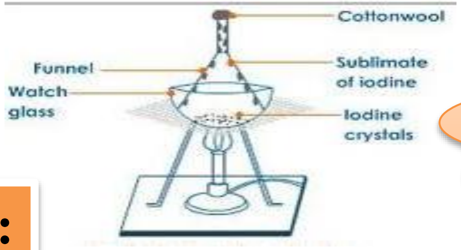
- Distillation
- Differential Extraction
- Chromatography

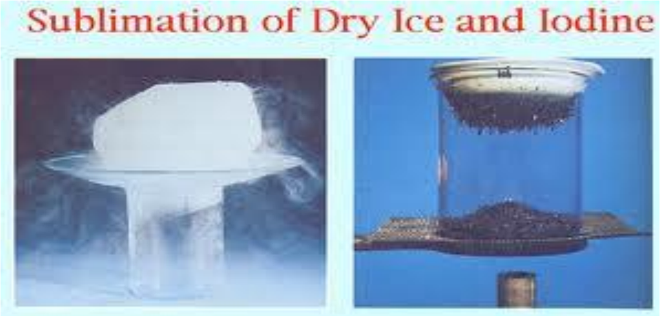
Liquids

Sublimation

Change from solid to vapour.

Without passing through liquid state





The process of conservation of a solid directly into its vapour is called sublimation

Use :

- To separate sublimable compound from non–sublimable impurities

Methods of Purification of Solids

- Crystallization
- Fractional Crystallization

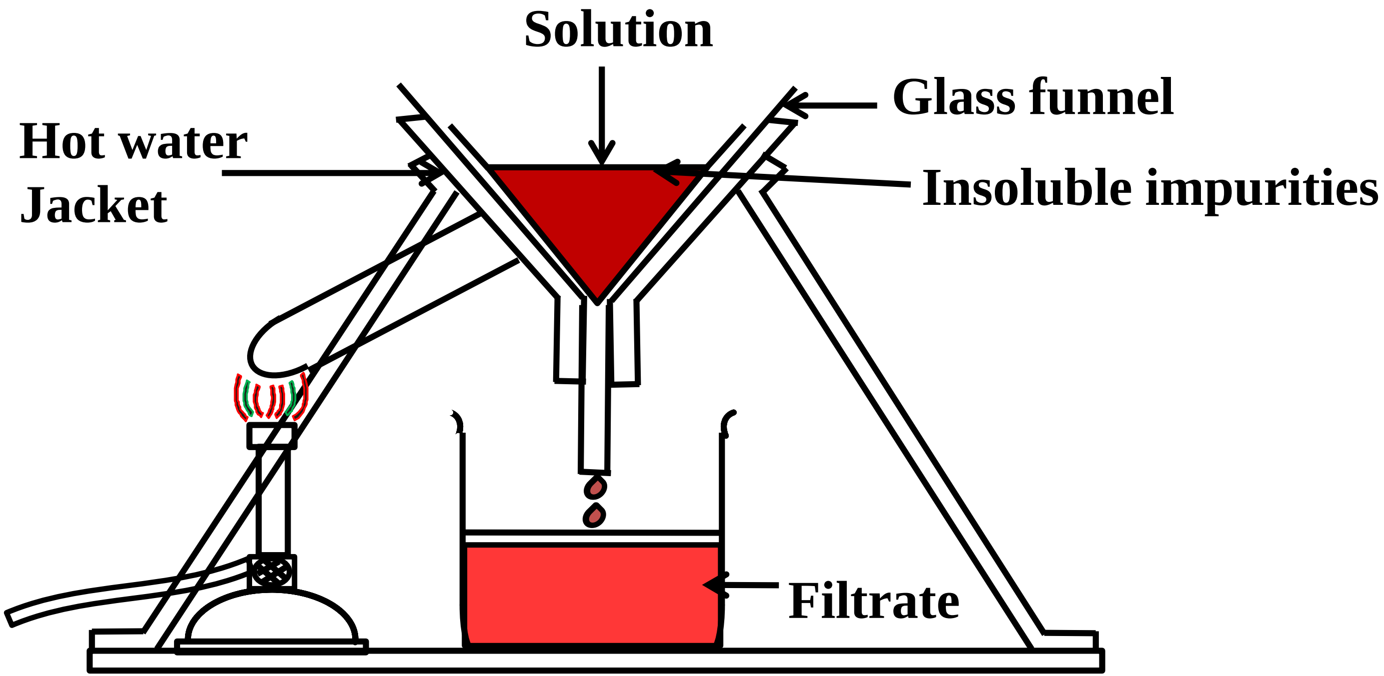
CRYSTALLIZATION

Obtaining solid in pure and crystalline form from its solution.

Principle :

Substance is more soluble in a given solvent at higher temperature than at lower temperature .

CRYSTALLIZATION



Choice of solvent

Compound being crystallized → More soluble at high temperature.

→ Least soluble at room temperature.

Room temperature : impurities → insoluble/ sparingly soluble.

Solvent → No reaction with compound to be purified.

Solvent → Low B.P → Removal easier.

Solvent → Low viscosity

FRACTIONAL CRYSTALLIZATION

- **Separating components of mixture of two or more solids, having different solubilities in the same solvent at the same temperature, by step wise crystallization**
- **Least soluble substance crystallizes out first (separated.)**
- **Recrystallization.**
- **More soluble substance crystallizes out.**

MCQs

1. Which of the following is **not** a criterion of purity of a substance ?

   1) Solubility

   2) Melting point

   3) Boiling point

   4) Density

Answer

2. Which of the following is an example of amorphous substance ?

1) Glucose

2) Glass

3) Alum

4) Common salt

Answer

3. Which is **not** a characteristic of crystalline substances ?

1) Orderly arrangement of constituents

2) Definite 3D shape

3) Sharp MP

3) Insolubility in water

Answer

4. Substance, being more soluble at a higher temperature than lower temperature is the principle of which purification technique ?

Answer

1) Sublimation

2) Crystallization

3) Distillation

4) Chromatography

DISTILLATION

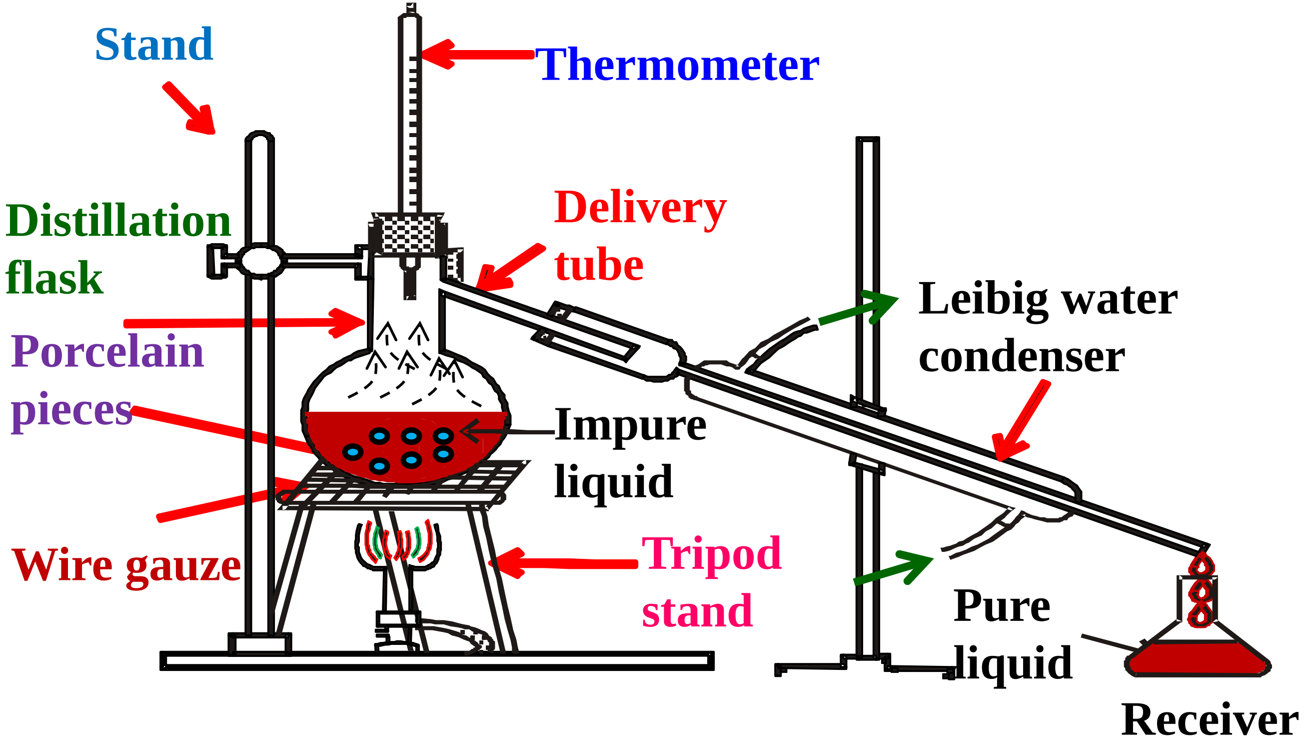
DISTILLATION

Liquid is converted into its vapour phase at its boiling point and vapour is then condensed back to liquid on cooling is known as *DISTILLATION*

Principle :

- **It involves both evaporation of a liquid and condensation of its vapour.**

SIMPLE DISTILLATION GAP



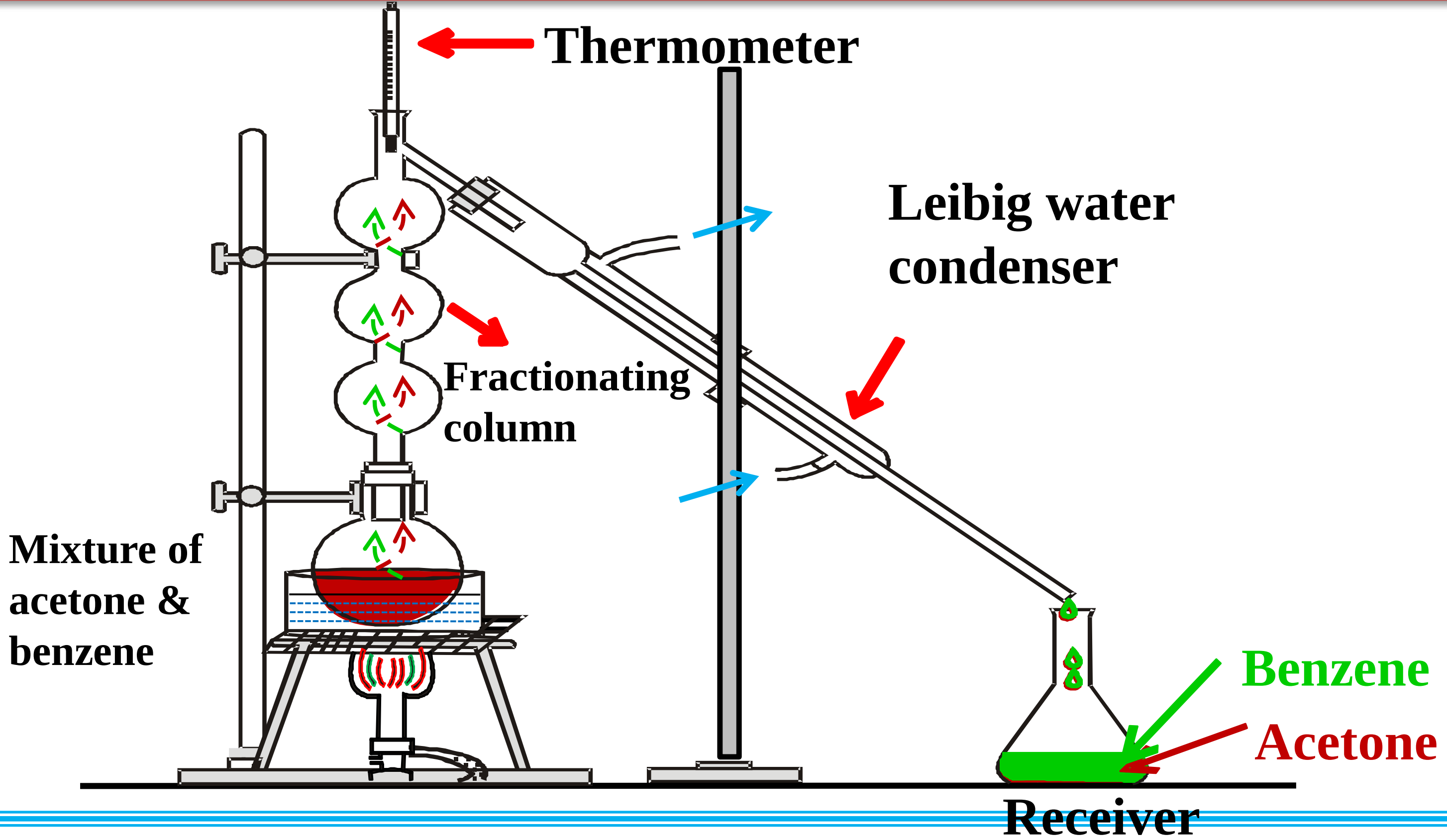
Fractional Distillation

“Separating and purifying the components of a mixture of two or more miscible liquids having different boiling points.”

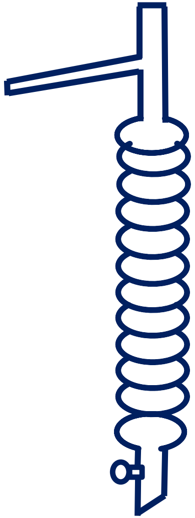
Principle :

More volatile liquid distills out first leaving behind the less Volatile liquid.

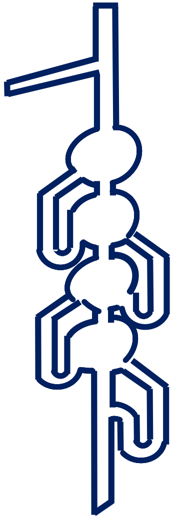
FRACTIONAL DISTILLATION USING FRACTIONATING COLUMN



FRACTIONATING COLUMNS

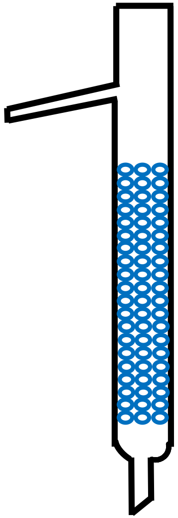


Younger's pear shaped column

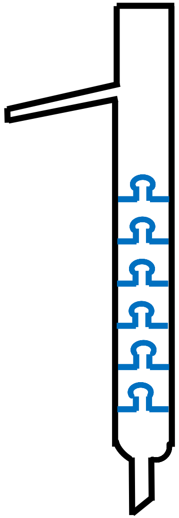


Hemple's column

FRACTIONATING COLUMNS

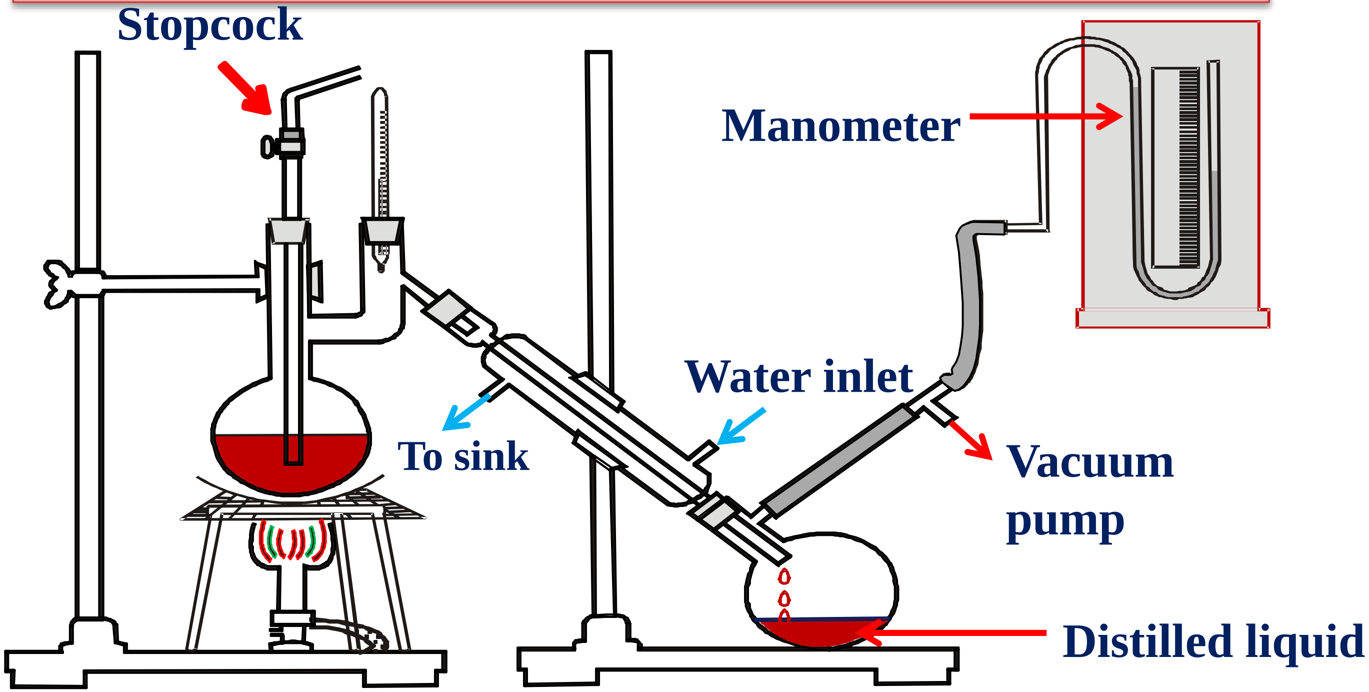


Simple packed column



Bubble plate column

DISTILLATION UNDER REDUCED PRESSURE



DISTILLATION UNDER REDUCED PRESSURE

- Applicable to the purification of liquids that have high boiling points and decompose at or below their boiling points.

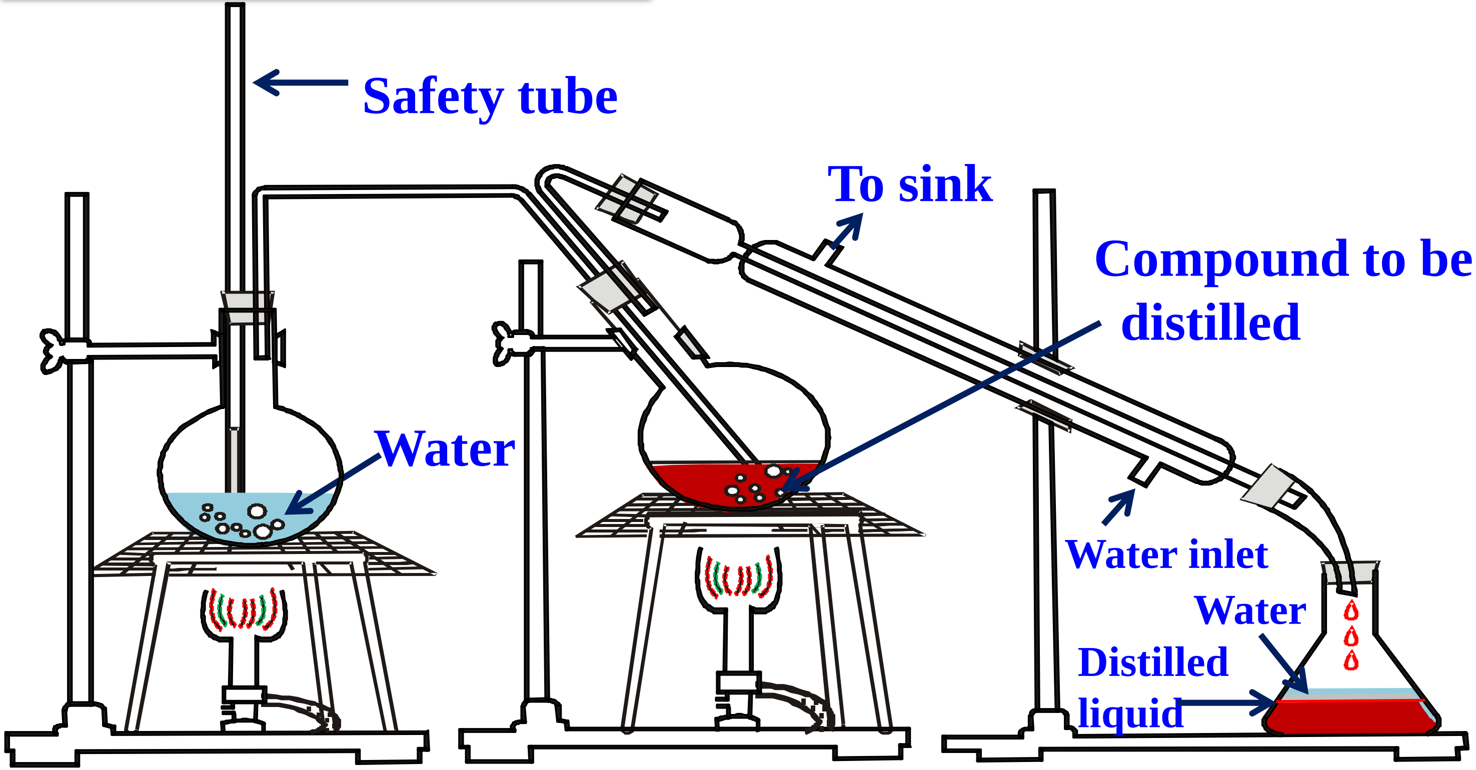
Principle :

By lowering the external pressure b.p of the liquid can be decreased.

Example :

H_2O_2 normal b.p at 760 mm pressure is 152^0C, but by decreasing external pressure to 65 mm, it boils at 85^0C.

STEAM DISTILLATION



MCQs

1. **The method in which liquid is converted into its vapour phase and the vapour is condensed back to liquid is called…**

Answer

1) **Sublimation.**

2) **Crystallisation.**

3) **Distillation.**

4) **Chromatography.**

2. When the difference between boiling points of two miscible liquids is less than 30^0 C, they can be separated by ..

1) Distillation under reduced pressure

2) Fractional distillation

3) Fractional distillation using fractionating column

4) Steam distillation

Answer

3. Purification of liquids with very high boiling points can be carried out by:

1) Distillation under reduced pressure

2) Fractional distillation

3) Fractional distillation using fractionating column

4) Steam distillation

Answer

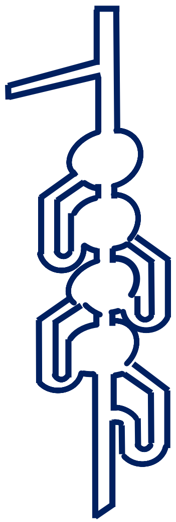
4. Identify the type of fractionating column.

1) Younger's pear shaped column

2) Hemple's column

3) Simple packed column

4) Bubble plate column



Answer

CHROMATOGRAPHY

Chromatography

[Chroma = colour]

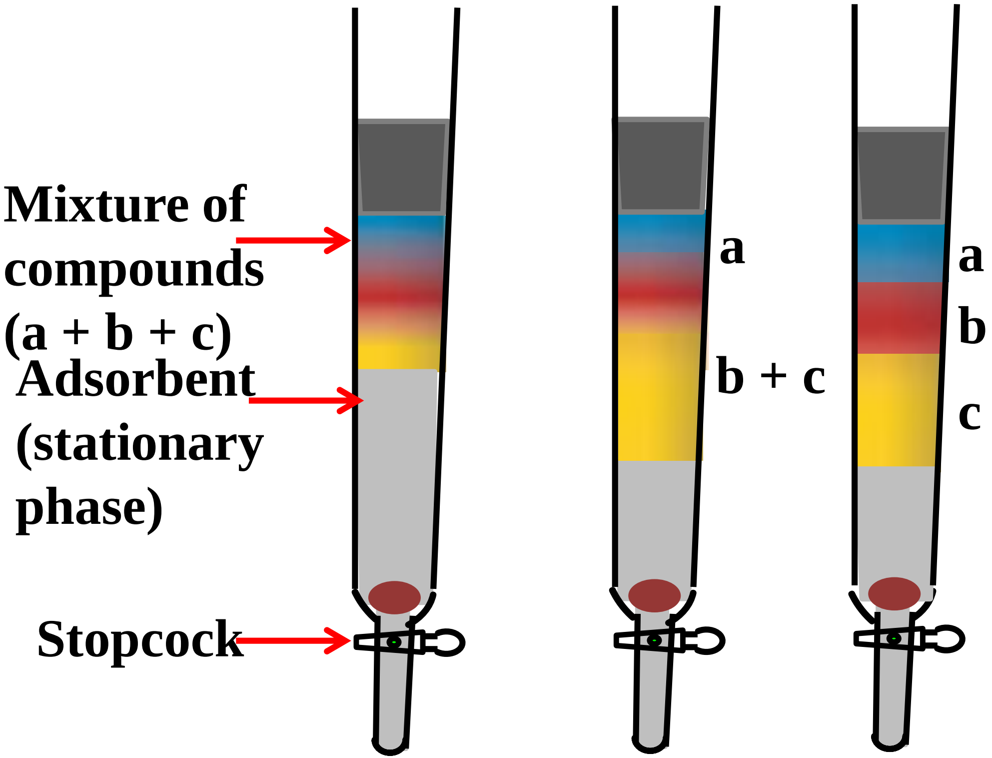
- Stationary phase – Solid or liquid
- Mobile phase – liquid or gas

1. Adsorption chromatography :

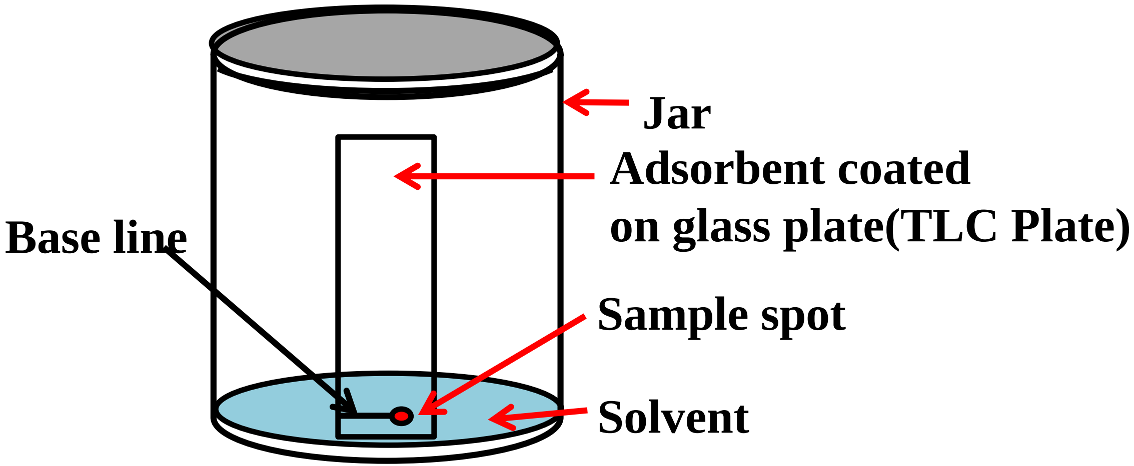
Principle : Differential Adsorption

Different compounds are adsorbed on an adsorbent to different degrees.

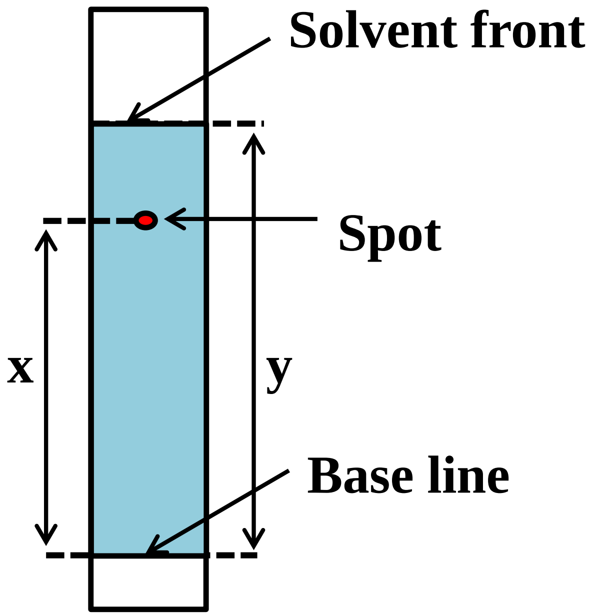
a) **Column chromatography :**



Thin layer chromatography :



Thin layer chromatography :



Developed chromatogram

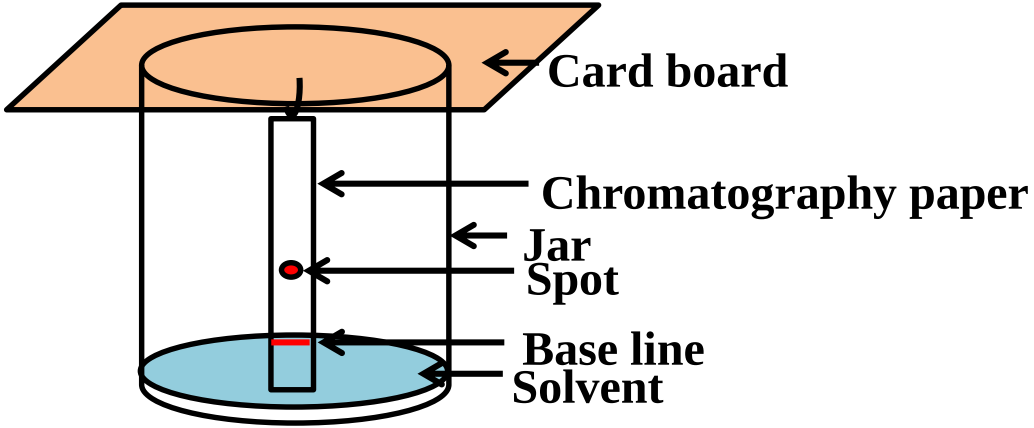
Retardation factor (R_f Value)

$$R_f = \frac{\text{Distance travelled by the solute(substance) from the base line (x)}}{\text{Distance travelled by the solvent from the base line (y)}}$$

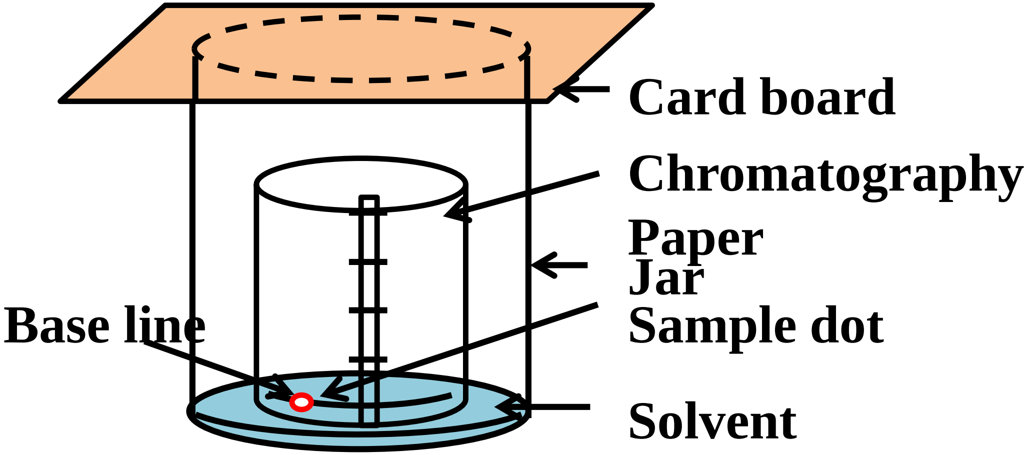
Partition Chromatography

Based on continuous differential partitioning of components of a mixture between stationary phase and mobile phase.

Paper chromatography



Paper chromatography



1. The principle of column chromatography is ..

1) Adsorption

2) Partition

3) Absorption

4) Diffusion

MCQs

Answer

2. The relative adsorption of each component of a mixture can be determined by using...

1) P_f value

2) K_f value

3) R_f value

4) Q_f value

Answer

3. Which of the following is a type of Partition Chromatography ?

1) Column Chromatography

2) Thin layer Chromatography

3) Paper Chromatography

4) All the above

Answer

Types of organic reaction

Substitution reactions

A reaction in which an attacking species (nucleophile, electrophile, or free radical replace another atom or group in the substrate is called substitution reaction.)

$H_3C - CH_2 - Cl$ + KOH

(Chloroethane) (aq.)

(ethyl chloride)

$\downarrow \Delta$

$H_3C - CH_2 - Cl$ + KOH

(Ethanol)

(ethyl alcohol)

Here, in this reaction, nucleophile Cl^- is replaced by ^-OH

Types of organic reaction

Addition reactions

When two molecules combine to form only one product molecule, it is called an addition reaction.

$$H_2C = CH_2 \quad + \quad HCl \longrightarrow H_3C = CH_2 - \quad + \quad HCl$$

(Ethene) (ethyl chloride)

(ethylene) (Chlorethane)

Types of organic reaction

Elimination reactions

When one molecule is split into two fragment molecules, it is called an elimination reaction.

$$\overset{2}{H_3C} - CH_2 - Cl + \underset{\text{(alc.)}}{KOH} \xrightarrow{\Delta} H_2C = CH_2 + KCl + H_2O$$

(Chloroethane)
(ethyl chloride)

(Ethene)
(ethylene)

So, Compounds containing C – C bond is converted into C = C, by removing atoms or group of atoms from adjacent carbon atoms.

Types of organic reaction

Rearrangement reactions

$$H_2C = CH - OH \xrightleftharpoons{\text{Tautomerism}} H_2C = CH - OH$$

(Ethenol) (vinyl alcohol) → (Ethanal) (acetaldehyde)

A reaction in which either the carbon skeleton or the functional group or both are modified is known as rearrangement reaction.

1) $CH_3-Br + KOH_{(aq)} \xrightarrow{\Delta} CH_3-OH + KBr$

a) addition reaction

b) elimination reaction

c) substitution reaction

d) rearrangement reaction

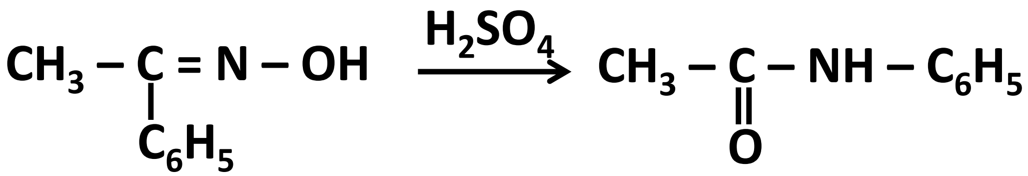
2) $CH_3-CH=CH_2 + Cl_2 \longrightarrow CH_3-\underset{\displaystyle Cl}{\underset{|}{CH}}-CH_2-Cl$

a) addition reaction

b) elimination reaction

c) substitution reaction

d) rearrangement reaction

3) 

a) addition reaction

b) elimination reaction

c) substitution reaction

d) rearrangement reaction

4) $CH_3 - CH_2 - OH \xrightarrow{\text{conc. } H_2SO_4} CH_2 = CH_2 + H_2O$

a) addition reaction

b) elimination reaction

c) substitution reaction

d) rearrangement reaction

QUALITATIVE ANALYSIS OF ORGANIC COMPOUNDS

Qualitative Analysis of Organic compounds

Detection of elements in a compound:

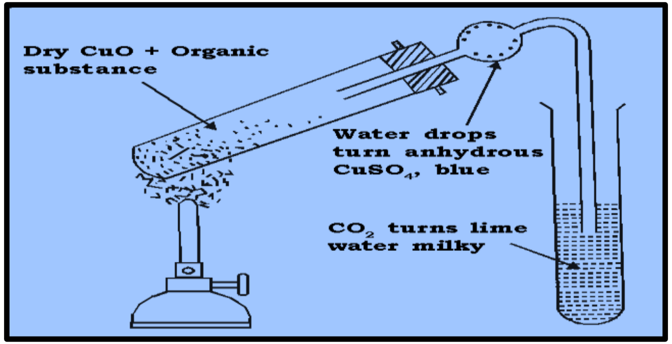
1. Detection of carbon and hydrogen :

$$C + 2CuO \xrightarrow{\Delta} 2Cu + CO_2$$

$$2H + CuO \xrightarrow{\Delta} Cu + H_2O$$

$$\underset{\text{Lime water}}{CO_2 + Ca(OH)_2} \xrightarrow{\Delta} \underset{\text{Milky solution}}{CaCO_3\downarrow + H_2O}$$

$$\underset{\text{Anhydrous (white)}}{5H_2O + CuSO_4} \longrightarrow \underset{\text{Hydrated (blue)}}{CuSO_4.5H_2O}$$



Detection of other Elements :

- **Nitrogen, Halogen and Sulphur: Lassaigne's method**

$$Na + C + N \xrightarrow{\Delta} NaCN$$

$$Na + X \longrightarrow NaX \; (X = Cl, Br \text{ or } I)$$

$$2Na + S \longrightarrow Na_2S$$

Test for Nitrogen

Sodium fusion extract

↓ **Boiled with $FeSO_4$ + conc. H_2SO_4 + $FeCl_3$ solution**

- **Prussian blue complex(presence of Nitrogen)**

$$2NaCN + FeSO_4 \rightarrow Na_2SO_4 + Fe(CN)_2$$

$$Fe(CN)_2 + 4NaCN \rightarrow Na_4[Fe(CN)_6]$$

$$3Na_4[Fe(CN)_6] + 4FeCl_3 \rightarrow Fe_4[Fe(CN)_6]_3$$ **(Prussian blue)**

Note:

This test fails in case of diazo compounds and if nitrogen is the part of the ring since these lose N_2 on heating .

Test for Sulphur

Test 1: **Sodium fusion extract**

$\downarrow$ **Acetic acid + Lead acetate**

Black ppt (PbS)

(Presence of Sulphur)

$$Na_2S + Pb(CH_3COO)_2 \rightarrow PbS\downarrow + 2CH_3COONa$$

Test 2: **Sodium fusion extract +Sodium nitroprusside = purple colour**

$$Na_2S + Na_2[Fe(CN)_5NO] \rightarrow Na_4[Fe(CN)_5NOS]$$ **purple colour compound**

If organic compound contains both nitrogen, sulphur

$Na + C + N + S \rightarrow NaSCN$

NaSCN on addition of $FeCl_3$ gives blood red colour due to the formation of

$Fe(SCN)_3$

$3NaSCN + FeCl_3 \rightarrow Fe(SCN)_3 + 3NaCl$

Test for Halogens

Sodium fusion extract

↓ Boiled with conc. HNO_3

Decompose Sodium cyanide / sodium sulphide

↓ $AgNO_3$

White ppt = AgCl

(soluble in NH_4OH)

(Presence of Chlorine)

Test for Halogens

$\Rightarrow$ Pale yellow ppt $\longrightarrow$ Sparingly soluble in NH_4OH

$\boxed{= AgBr}$ $\boxed{\text{Presence of Bromine}}$

$\Rightarrow$ Yellow ppt $\longrightarrow$ Insoluble in NH_4OH

$\boxed{= AgI}$ $\boxed{\text{Presence of Iodine}}$

Test for Phosphorous

Compound + Na_2O_2

↓

Phosphorous oxidised to phosphate

↓ Boiled with HNO_3 + Ammonium Molybdate

Yellow colouration / ppt

(Presence of Phosphorus)

$$Na_2PO_4 + 3HNO_3 \rightarrow H_3PO_4 + 3NaNO_3$$

$$H_3PO_4 + 12(NH_4)_2MoO_3 + 21HNO_3 \rightarrow$$
$$(NH_4)_3PO_4.12MoO_3 + 21NH_4NO_3 + 12H_2O$$

Yellow ppt.

Metals

Organic compound containing metal

$$\downarrow \Delta$$

Organic part burns away

$$\downarrow$$

Residue – usually oxide of the metal

Oxygen

Detected from chemical properties of compound

MCQs

1. Nitrogen , halogen and sulphur are detected in an organic compound by...

Answer

1) Lassaigne method

2) Carius method

3) Dumas method

4) Kjeldahl’s method

2. Lime water turns milky, is used to confirm the presence of…

Answer

1) Nitrogen

2) Phosphorus

3) Carbon

4) Sulphur

3. In Lassaigne's test, treatment of Sodium fusion extract with acetic acid and lead acetate is done to detect presence of..

Answer

1) Nitrogen

2) Halogens

3) Carbon

4) Sulphur

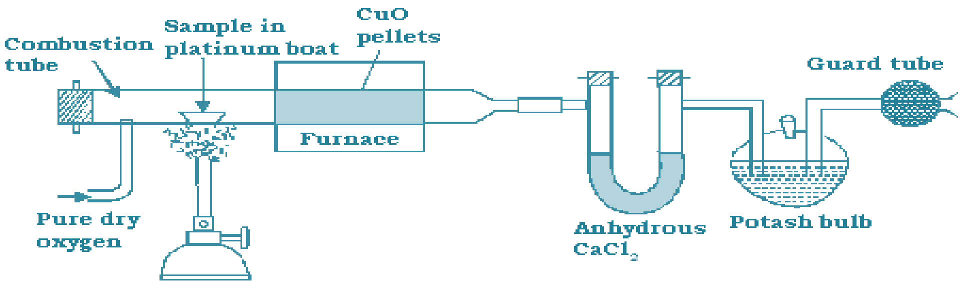
QUANTITATIVE ELEMENTAL ANALYSIS
(PART-I)

Quantitative Analysis of Organic Compounds

➢ **Determination of percentage composition of elements in a compound.**

a) **Carbon and hydrogen :**

$$C_xH_y + \left(x + \frac{y}{4}\right) O_2 \rightarrow xCO_2 + \frac{y}{2} H_2O$$



APPARATUS FOR THE ESTIMATION OF C AND H

Calculation :

- **Let the mass of organic compound be 'm' g, mass of water be 'm_1' g and mass of carbon dioxide be 'm_2' g.**

- **'18' g of water will contain 2 g of hydrogen**

- **'m_1' g of water will contain $\frac{2 \times m_1}{18}$ g of hydrogen**

Calculation :

- 'm' g of organic compounds contain $\frac{2 \times m_1}{18}$ g of hydrogen
- 100 g of compound will contain $\frac{2 \times m_1 \times 100}{18 \times m}$ % of hydrogen

Similarly,

- 44g of carbon dioxide contains 12g of carbon
- 'm_2' g of carbon dioxide will contain $\frac{12 \times m_2}{44}$ g of carbon.

Similarly,

'm' g of organic compound contains $\frac{12 \times m_2}{44}$ **g of carbon**

100g of compound will contain $\frac{12 \times m_2 \times 100}{44 \times m}$ **% of carbon**

- **0.224 g of an organic compound, on complete combustion gives 0.126 g of water and 0.280 g of carbondioxide. Determine the percentage composition of hydrogen and carbon in the compound.**

18 g of water contains 2 g of hydrogen

$\therefore$ 0.126 g of water will contain

$$\frac{2 \times 0.126}{18} \text{ g of hydrogen}$$

0.224 g of organic compound contains

$$\frac{2 \times 0.126}{18} \text{ g of hydrogen}$$

$\therefore$ 100 g of compound will contain

$$\frac{2 \times 0.126 \times 100}{18 \times 0.224} = 6.25\ \%\ \text{of hydrogen}$$

- **0.224 g of an organic compound, on complete combustion gives 0.126 g of water and 0.280 g of carbondioxide. Determine the percentage composition of hydrogen and carbon in the compound.**

Now, 44 g of carbondioxide contains 12 g of carbon

$\therefore$ 0.280 g of carbondioxide will contain

$$\frac{12 \times 0.280}{44} \text{ g}$$

0.244 g of organic compound contains

$$\frac{12 \times 0.280}{44} \text{ g of carbon}$$

$\therefore$ 100 g of compound will contain

$$\frac{12 \times 0.280 \times 100}{44 \times 0.224}$$

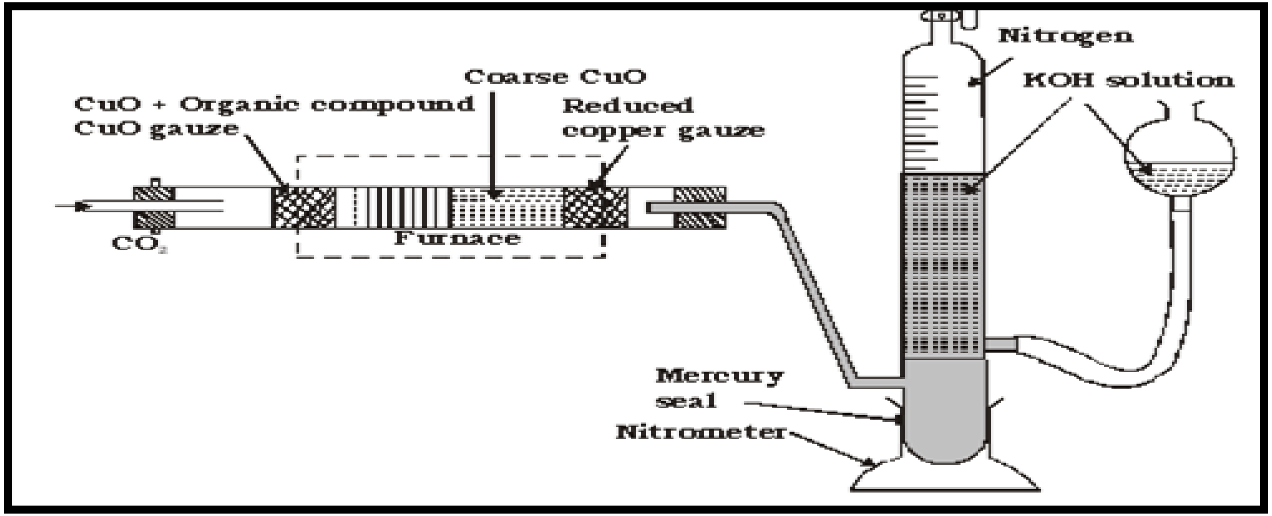
$$= 34.10\ \%\ \text{of carbon}$$

QUANTITATIVE ELEMENTAL ANALYSIS (PART-II)

b) **Nitrogen :**

i) Duma's method

$$C_xH_yN_z + \left(2x + \frac{y}{2}\right) CuO \rightarrow xCO_2 + \frac{y}{2} H_2O + \frac{z}{2}N_2 + \left(2x + \frac{y}{2}\right) Cu$$



Calculation :

- Let the mass of organic compound be 'm' g.
- Volume of nitrogen collected = V_1 ml
- Room temperature = T_1 K
- Atmospheric Pressure = P mm
- Aqueous tension at T_1 K = f mm
- Pressure of dry nitrogen = $P - f = P_1$ mm

Calculation :

- Let P_0, V_0 and T_0 be the pressure, volume and temperature respectively of dry nitrogen at STP.

Then
$$\frac{P_0V_0}{T_0} = \frac{P_1V_1}{T_1}$$

$$V_0 = \frac{T_0}{P_0} \times \frac{P_1V_1}{T_1}$$

22,400 ml of nitrogen at STP weighs 28 g

V_0 ml of nitrogen at STP will weigh $\dfrac{28 \times V_0}{22,400}$ g

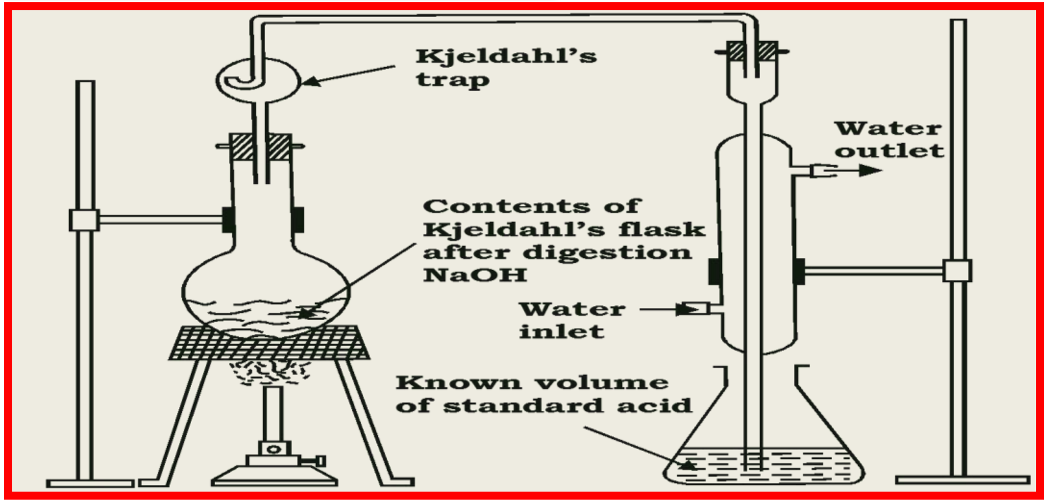
Calculation :

‘m’ g of organic compound contains $\frac{28 \times V_0}{22,400}$ g of nitrogen

100g of compound will contain $\frac{28 \times V_0 \times 100}{22,400 \times m}$ % of nitrogen

QUANTITATIVE ELEMENTAL ANALYSIS (PART-III)

Kjeldahl’s method



$$\text{Organic compound} + H_2SO_4 \longrightarrow (NH_4)_2SO_4$$

$$(NH_4)_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2NH_3 + 2H_2O$$

$$2NH_3 + H_2SO_4 \longrightarrow (NH_4)_2SO_4$$

Calculation :

- Let the mass of organic compound taken = m g
- Volume of H_2SO_4 of molarity "M" taken = VmL
- Volume of NaOH of molarity "M" used for titration of excess of H_2SO_4 = V_1mL

V_1 ml of NaOH of molarity M = $\frac{V_1}{2}$ ml of H_2SO_4 of molarity M

$\therefore$ Volume of H_2SO_4 of molarity M unused = $V - \frac{V_1}{2}$ mL

Calculation :

$\left(V - \frac{V_1}{2}\right)$ ml of H_2SO_4 of molarity M= $2\left(V - \frac{V_1}{2}\right)$ ml of NH_3 solution of molarity M.

1000 ml of 1M NH_3 solution contains 14g of nitrogen.

$\therefore 2\left(V - \frac{V_1}{2}\right)$ ml of NH_3 solution of molarity "M" will contain

$$\frac{14 \times M \times 2\left(V - \frac{V_1}{2}\right)}{1000}$$ g of nitrogen.

Calculation :

Let the mass of organic compound taken be 'm' g. Then, 'm' g of compound contains

$$\frac{14 \times M \times 2\left(V - \frac{V_1}{2}\right)}{1000} \text{ g of nitrogen.}$$

$\therefore$ 100 g of compound will contain

$$\frac{14 \times M \times 2\left(V - \frac{V_1}{2}\right)}{1000} \text{ \% of nitrogen}$$

$$\text{\% of nitrogen} = \frac{1.4 \times N \times \text{volume of base reacted with } NH_3}{\text{Wt. of organic compound}}$$

- **0.4 g of an organic compound in Dumas method gave 50 mL of nitrogen collected at 300 K temperature and 745 mm pressure. Calculate the percentage composition of nitrogen in the compound. Aqueous tension at 300 K is 15 mm.**

$m = 0.4$ g, $P_0 = 760$ mm, $T_0 = 273$ K

$V_0 = ?$ $P = 745$ mm, $f = 15$ mm,

$\therefore$ $P_1 = P - f = 745 - 15 = 730$ mm.

$V_1 = 50$ mL, $T_1 = 300$ K

$$\frac{P_0V_0}{T_0} = \frac{P_1V_1}{T_1}$$

$$\therefore \quad V_0 = \frac{P_1V_1}{T_1} \times \frac{T_0}{P_0}$$

$$= \frac{730 \times 50}{300} \times \frac{273}{760}$$

- **0.4 g of an organic compound in Dumas method gave 50 mL of nitrogen collected at 300 K temperature and 745 mm pressure. Calculate the percentage composition of nitrogen in the compound. Aqueous tension at 300 K is 15 mm.**

$$= 43.71 \text{ mL}$$

22,400 mL of nitrogen at STP weight 28 g

$\therefore$ **43.71 mL of nitrogen at STP will weigh**

$$\frac{28 \times 43.71}{22{,}400} \text{ g}$$

0.4 g of organic compound contains

$$\frac{28 \times 43.71}{22{,}400} \text{ g of nitrogen}$$

- **0.4 g of an organic compound in Dumas method gave 50 mL of nitrogen collected at 300 K temperature and 745 mm pressure. Calculate the percentage composition of nitrogen in the compound. Aqueous tension at 300 K is 15 mm.**

∴ 100 g of compound will contain

$$\frac{28 \times 43.71 \times 100}{22,400 \times 0.4} = 13.67\ \%\ \text{of nitrogen}$$

- 15 mL of 1 M H_2SO_4 is completely neutralized by ammonia liberated from 0.6 g of compound in Kjeldahl's method. Find out the percentage of nitrogen in the compound.

15 mL of 1M H_2SO_4 30 mL of 1M NH_3

Now,

1000 mL of 1M NH_3 contains 14g of nitrogen

$\therefore$ 30 mL of 1M NH_3 will contain

$$\frac{14 \times 30}{1000} \text{ g of nitrogen}$$

- **15 mL of 1 M H_2SO_4 is completely neutralized by ammonia liberated from 0.6 g of compound in Kjeldahl's method. Find out the percentage of nitrogen in the compound.**

0.6 g organic compound contains

$$\frac{14 \times 30}{1000} \text{ g of nitrogen}$$

100 g of compound will contains

$$\frac{14 \times 30 \times 100}{1000 \times 0.6}$$

$$= 70\ \% \text{ of nitrogen}$$

MCQs

Answer

1. Which of the following methods can be used for quantitative estimation of nitrogen ?

1) Dumas method

2) Kjeldahl’s method

3) Both a & b

4) Neither a nor b

2. Carius method can be used for detection of ..

Answer

1) halogens

2) sulphur

3) both a & b

4) neither a nor b

3. Kjeldahl’s method is not applicable to…

Answer

1) amines

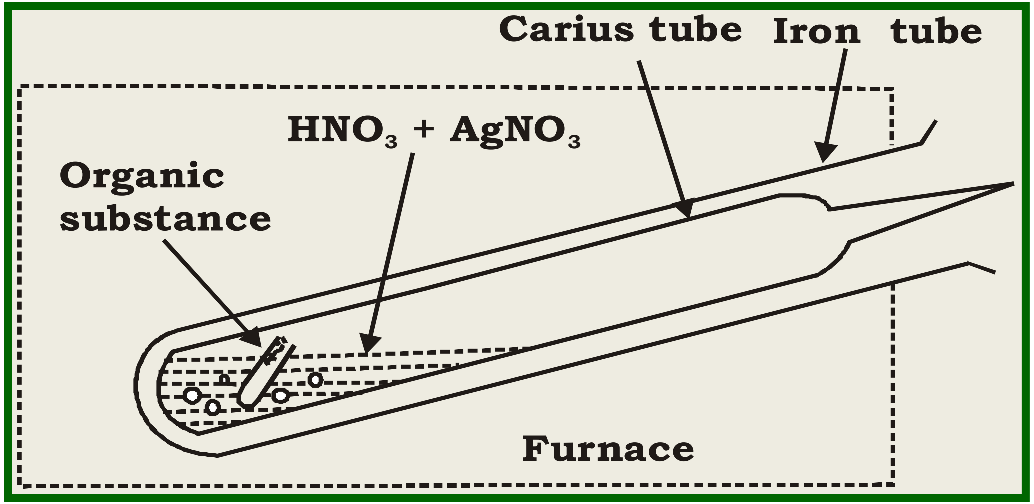
2) amides

3) heterocycles

4) none of the above

QUANTITATIVE ELEMENTAL ANALYSIS
(PART-IV)

Halogen : Carius Method



Calculation :

- Let the mass of compound taken = m g,
- If halogen (x) is chlorine then,
- Let the mass of $AgCl$ formed = m_1g
- The molecular mass of silver chloride is 143.5 g.
- 143.5 g of $AgCl$ contains 35.5 g of chlorine

$\therefore$ 'm_1' g of $AgCl$ will contains $\dfrac{35.5 \times m_1}{143.5}$ g of chlorine

Calculation :

'm_1' g of organic compound contains

$$\frac{35.5 \times m_1}{143.5} \text{ g of chlorine}$$

$\therefore$ 100 g of compound will contain

$$\frac{35.5 \times m_1 \times 100}{143.5 \times m} \text{ \% of chlorine}$$

$$\text{\% of X} = \frac{\text{Atomic wt. of halogen} \times \text{wt. of AgX} \times 100}{\text{Mol. Wt. of AgX} \times \text{wt. of O.C}}$$

- **0.2 g of an organic compound gave 0.15 g of silver chloride in Carius method for estimation of chlorine. Find out the percentage of chlorine in the compound.**

143.5 g of AgCl contains 35.5 g of chlorine

$\therefore$ 0.15 g of AgCl will contain

$$\frac{35.5 \times 0.15}{143.5} \text{ g of chlorine}$$

0.2 g of organic compound contains

$$\frac{35.5 \times 0.15}{143.5} \text{ g of chlorine}$$

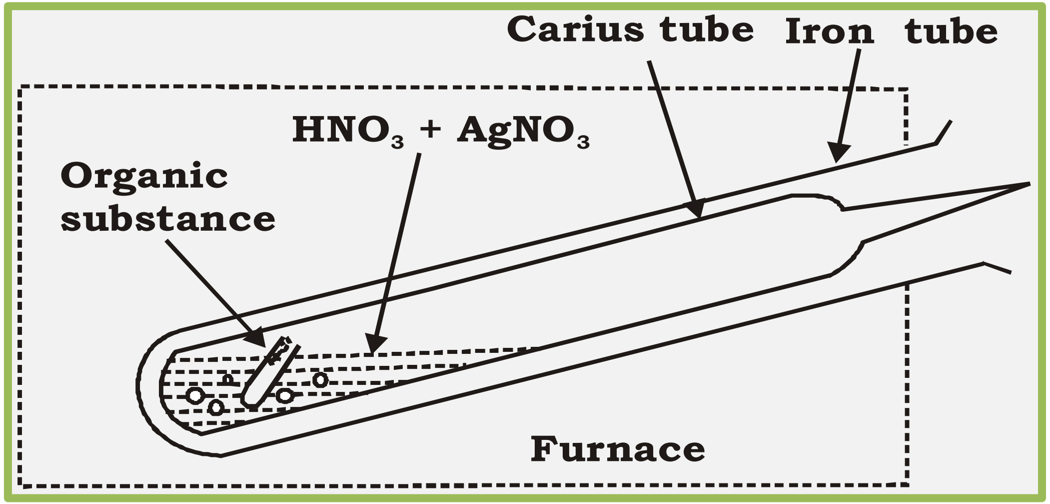
- **0.2 g of an organic compound gave 0.15 g of silver chloride in Carius method for estimation of chlorine. Find out the percentage of chlorine in the compound.**

$\therefore$ **100 g of compound will contain**

$$\frac{35.5 \times 0.15 \times 100}{143.5 \times 0.2} = 18.56\ \%\ \text{of chlorine}$$

QUANTITATIVE ELEMENTAL ANALYSIS
(PART-V)

Sulphur :


Carius tube
Iron tube
$HNO_3 + AgNO_3$
Organic substance
Furnace

Calculation :

Let the mass of organic compound taken = m g

Let the mass of barium sulphate formed = m_1 g

Molecular mass of $BaSO_4$ = 233

One mole of $BaSO_4$ = 233 g of $BaSO_4$ = 32g of Sulphur

233 g of $BaSO_4$ contains 32 g of sulphur

$\therefore$ 'm_1' g of $BaSO_4$ will contain $\dfrac{32 \times m_1}{233}$ g of sulphur

Calculation :

'm' g of organic compound contains $\dfrac{32 \times m_1}{233}$ g of sulphur

$\therefore$ 100 g of compound will contain $\dfrac{32 \times m_1 \times 100}{233 \times m}$ % of sulphur

- **In the estimation of sulphur by Carius method, 0.468 g of an organic sulphur compound afforded 0.668 g of barium sulphate. Find out the percentage of sulphur in the given compound.**

233g of $BaSO_4$ contains 32g of sulphur

$$\therefore\ 0.668\text{g of } BaSO_4 \text{ contains } \frac{32 \times 0.668}{233} \text{ g of sulphur}$$

$$\therefore 0.468\text{g of Organic compound contains } \frac{32 \times 0.668}{233} \text{ g of sulphur}$$

$$\therefore 100\text{g of } BaSO_4 \text{ contains } = \frac{32 \times 0.668 \times 100}{233 \times 0.468} = 19.60\%$$

QUANTITATIVE ELEMENTAL ANALYSIS
(PART-VI)

Phosphorus Method I :

Compound + fuming HNO_3

$\Delta \downarrow$ (oxidised)

Phosphoric acid

$\downarrow$ NH_3 + Ammonium Molybdate

Ammonium phospho molybdate (ppt) $(NH_4)_3 PO_4 . 12MoO_3$

$\downarrow$

Filtered → washed → dried

Calculation : **Method I :**

- Let ‘m’ g be the mass of compound taken and ‘m_1’ g be the mass of ammonium phosphomolybdate.
- Molecular mass of ammonium phosphomolybdate is 1877.

Now,

1877g of $(NH_4)_3\ PO_4.12\ MoO_3$ contains 31 g of phosphorus

$\therefore$ m_1 g of $(NH_4)_3\ PO_4.12\ MoO_3$ will contain $\dfrac{31 \times m_1}{1877}$ g of phosphorus

Calculation : **Method I :**

$\therefore$ 'm_1' g of organic compound contains $\dfrac{31 \times m_1}{1877}$ g of phosphorus

$\therefore$ 100 g of compound will contain $\dfrac{31 \times m_1 \times 100}{1877 \times m}$ % of phosphorus

Phosphorus Method II :

Compound + fuming HNO_3

$\Delta \downarrow$ **(oxidised)**

Phosphoric acid

$\downarrow$ **magnesium**

$Mg\ NH_4PO_4$ (ppt)

$\downarrow$ **Ignition**

$Mg_2P_2O_7$

Calculation : **Method II :**

Let the mass of compound taken be 'm' g and mass of $Mg_2P_2O_7$ formed be 'm_1' g

Molecular mass of $Mg_2P_2O_7$ = 233

222 g of $Mg_2P_2O_7$ contains 62 g of phosphorus

'm_1' of $Mg_2P_2O_7$ will contain $\frac{62 \times m_1}{222}$ g of phosphorus

Calculation : **Method II :**

'm' g of organic compound contain $\frac{62 \times m_1}{233}$ g of phosphorus

100 g compound will contain $\frac{62 \times m_1 \times 100}{222 \times m}$ % of phosphorus

- **0.4 g of an organic compound containing phosphorus gave 0.555 g of magnesium pyrophosphate by usual analysis. Calculate the percentage of phosphorus in compound.**

Mass of organic compound = 0.4 g

Mass of $Mg_2P_2O_7$ = 0.555 g

222 g of $Mg_2P_2O_7$ contains 62 g of phosphorus

$$\therefore 0.555 \text{ g of } Mg_2P_2O_7 = \frac{0.555 \times 62}{222}$$

$$= 0.155 \text{ g of phosphorus}$$

- **0.4 g of an organic compound containing phosphorus gave 0.555 g of magnesium pyrophosphate by usual analysis. Calculate the percentage of phosphorus in compound.**

0.4 g of Organic compound contains 0.155 g of phosphorus

$\therefore$ 100 g of Organic compound contains

$$= \frac{0.155 \times 100}{0.4}$$

$$= 38.75 \text{ g of phosphorus}$$

QUANTITATIVE ELEMENTAL ANALYSIS (PART-VII)

Oxygen calculation :

Organic compound $\xrightarrow{heat}$ O_2 + other gaseous products

$$2C + O_2 \xrightarrow{1373K} 2CO \quad \ldots\ldots\ldots\ldots\ldots\ldots (Eq – i)$$

(Red – Hot coke)

$$5CO + I_2O_5 \longrightarrow 5CO_2 + I_2 \quad \ldots\ldots\ldots\ldots\ldots\ldots (Eq – ii)$$

Oxygen calculation :

The amount of CO produced in equation

(i) is made equal to the amount of CO used in equation (ii) as follows.

$$\text{(i)} \times 5 \qquad 10C + 5O_2 \longrightarrow 10CO$$

$$\text{(ii)} \times 2 \qquad 10CO + 2I_2O_5 \longrightarrow 10CO_2 + 2I_2$$

Thus, 5 moles of oxygen produces 10 moles of carbon dioxide. In other words, each mole of oxygen liberated from the compound will produce two moles of carbon dioxide.

$\therefore$ 1 mole O_2 (32 g) = 2 moles CO_2 ($2 \times 44 = 88$ g)

Calculation :

Let 'm' g be the mass of organic compound and 'm_1' g be the mass of carbon dioxide.

88g of CO_2 is produced from 32 g of O_2

'm_1' g of CO_2 will be produced from $\frac{32 \times m_1}{88}$ g of O_2

Calculation :

'm' g of organic compound contains $\dfrac{32 \times m_1}{88}$ g of O_2

100 g compound will contain $\dfrac{32 \times m_1 \times 100}{88 \times m}$ % of oxygen

OBJECTIVE QUESTIONS
LEVEL-I

LEVEL - I

1) Which of the following forms a criterion of purity of organic compound?

1) Molecular mass

2) Empirical mass

3) Melting or boiling point

4) Solubility

2) Two solids A and B have appreciable different solubilities in water but their melting points are very close. The mixture of A and B can be separated by

1) Sublimation

2) Fractional crystallization

3) Distillation

4) Fractional distillation

3) **The process of differential extraction is based upon…**

1) **Different solubilities**

2) **Different molecular masses**

3) **Different boiling points**

4) **Different chemical properties**

4) Latest technique for purification, isolation and separation of organic substances is

1) Distillation

2) Crystallisation

3) Sublimation

4) Chromatography

5) Sublimation is a process where a solid…

1) Melts

2) Changes into liquid form

3) Boils

4) Changes into vapour form directly

6) Liquids which decompose below their normal boiling point can be distilled at lower temperature by

1) Increasing the external pressure

2) Decreasing the external pressure

3) Heating in water bath

4) Heating in sand bath

7) **Boiling point of a liquid can be increased by…**

1) **Increasing the external pressure**

2) **Decreasing the external pressure**

3) **Purifying the liquid**

4) **Adding water to it**

8) **Distillation is used to separate liquids which differ in their boiling points by…**

1) 5^0 C

2) 10^0 C

3) 30^0 to 80^0 C

4) 100^0 C

9) Two immiscible liquids can be separated by using…

1) Fractioning column

2) Separating funnel

3) Vacuum distillation

4) Steam distillation

10) A mixture of benzene and chloroform is separated by…

1) Sublimation

2) Distillation

3) Crystallisation

4) Steam distillation

11) Impure naphthalene is purified by :

1) Fractional crystallization

2) Fractional distillation

3) Soxhlet extraction

4) Sublimation

12) Anthracene is purified by…

1) Filtration

2) Distillation

3) Crystallisation

4) Sublimation

13) Vaccum distillation is used to purify liquids which:

1) Are highly volatile

2) Are explosive in nature

3) Decompose below their boiling points

4) Have high b.p

14) Aniline is purified by …

1) Steam distillation

2) Simple distillation

3) Vacuum distillation

4) Extraction with a solvent

15) A mixture of acetone and methanol can be separated by:

1) Steam distillation

2) Vaccum distillation

3) Fractional distillation

4) None of these

16) Fractional distillation is useful in distillation of …

1) Petroleum

2) Coal - tar

3) Crude alcohol

4) All of these

17) Chromatography technique was introduced by

1) Fischer

2) Pauling

3) Rutherford

4) Tswett

18) Steam distillation is applied for the separation of those compounds which are

1) Steam volatile and soluble in water

2) Steam volatile and decompose in water

3) Steam volatile and insoluble in water

4) Capable of chemical reaction with steam

19) Chromatography technique is used for the separation of:

1) Small samples of a mixture

2) Plant pigments

3) Dyestuff

4) All of the above

20) In paper chromatography

1) Mobile phase is liquid and stationary phase is solid

2) Mobile phase is solid and stationary phase is liquid

3) Both phases are liquids

4) Both phases are solids

21) In column chromatography the moving phase is constituted of

1) A substance which have to be separated

2) Eluent

3) Adsorbent

4) Mixture of eluent and substances to be separated

QUALITATIVE ANALYSIS

22) There is no direct test for the detection of following in organic compound

1) Cl

2) N

3) S

4) O

23) In Lassaigne's test, the organic compound is fused with sodium metal so as to

1) Burn the compound

2) Form a sodium derivative

3) Convert N, S or halogen into soluble ionic compound

4) Convert N, S or halogen into insoluble covalent compound

24) Lassaigne's test is used for the detection of …

1) Carbon only

2) Hydrogen only

3) Oxygen only

4) N, S and X

25) The sodium extract of an organic compound on acidification with acetic acid and addition of lead acetate solution gives a black precipitate. The organic compound contains :

1) Nitrogen

2) Halogen

3) Sulphar

4) Phosphorus

26) Nitrogen containing organic compound when fused with sodium forms…

1) Sodium azide

2) Sodium cyanide

3) Sodamide

4) Sodium cyanate

27) The sodium extract of an organic compound on the treatment with $FeSO_4$ solution, $FeCl_3$ and HCl gives a red solution . The organic compound contains…

1) Both nitrogen and sulphur

2) Nitrogen only

3) Sulphur only

4) Halogen

QUANTITATIVE ANALYSIS

28) Carbon and hydrogen are estimated in organic compounds by...

1) Kjeldahl’s method

2) Duma’s method

3) Liebig’s method

4) Carius method

29) In Kjeldahl's method nitrogen present is estimated as

1) N_2

2) NH_3

3) NO_2

4) N_2O

30) In organic compounds P is estimated as

1) H_3PO_4

2) P_2O_5

3) $Mg_3(PO_4)_2$

4) $Mg_2P_2O_7$

31) Kjeldahl's method cannot be used for the estimation of nitrogen in

1) Pyridine

2) Nitro compounds

3) Azo compounds

4) All

32) 0.2g of an organic compound on complete combustion produces 0.18g of water the percentage of hydrogen in it is

1) 5 **2) 10** **3) 15** **4) 20**

Solution :

$$\% \text{ H} = \frac{2}{18} \text{ x } \frac{Wt.of\ H_2O}{wt.of\ organic\ compound} \times 100$$

$$= \frac{2}{18} \text{ x } \frac{0.18}{0.2} \times 100$$

$$= 10$$

33) In the estimation of sulphur in an organic compound, fuming nitric acid is used to convert sulphur into:

1) SO_2

2) H_2S

3) H_2SO_3

4) H_2SO_4

34) Mark the incorrect statement in nitrogen Kjeldahl's method of estimation

1) Nitrogen gas is collected over caustic potash solution

2) Potassium sulphate is used as boiling point elevator of H_2SO_4

3) Copper sulphate or mercury acts as a catalyst

4) Nitrogen is quantitatively decomposed to give ammonium sulphate

35) **An organic compound contains carbon, hydrogen and oxygen. The percentage of carbon is 36 while of hydrogen is 4. The percentage of oxygen will be**

1) (100-36)

2) (100-4)

3) [100-(36+4)]

4) [100-36+4]

OBJECTIVE QUESTIONS
LEVEL-II

LEVEL - II

Purification :

1) In steam distillation the vapour pressure of the volatile organic compound is

1) Equal to atmospheric pressure

2) Less than the atmospheric pressure

3) More than the atmospheric pressure

4) Just double the atmospheric pressure

2) **Absolute alcohol cannot be obtained by simple fractional distillation because:**

1) **Pure C_2H_5OH is unstable**

2) **C_2H_5OH forms hydrogen bonds with water**

3) **Boiling point of C_2H_5OH is very close to that of water**

4) **Constant boiling azeotropic mixture is formed with water**

3) The most suitable method for separation of a 1:1 mixture of ortho – and para – nitrophenols is…

1) Sublimation

2) Chromatography

3) Crystallization

4) Steam distillation

4) A mixture containing large number of components is separated by…

1) Distillation

2) Chromatography

3) Vacuum distillation

4) Steam distillation

5) A substance which is insoluble in water and possesses a vapour pressure of 10 to 15 mm Hg at 373K can be conveniently purified by

1) Sublimation

2) Crystallization

3) Distillation

4) Steam distillation

6) Simple distillation can be used to separate

1) A mixture of benzene (b.p. 80^{0}C) and thiopene (b.p. 84^{0}C)

2) A mixture of ethanol (b.p. 78^{0}C) and water (b.p. 100^{0}C)

3) A mixture of ether (b.p. 35^{0}C) and toluene (b.p. 110^{0}C)

4) All of these

7) The boiling point of a compound does not depend upon

1) Solubility of the compound in water

2) Hydrogen bonding

3) Size of the molecule

4) Polarity of the molecule

8) Fractional crystallizations is carried out to separate a mixture of:

1) Organic solids mixed with inorganic solids

2) Organic solids slightly soluble in water

3) Organic solids having small difference in their solubilities in a suitable solvent

4) Organic solids having great difference in their solubilities in a suitable solvent

9) The relative absorption of each component of the mixture is expressed in terms of…

1) Adsorption factor

2) Retention factor

3) Co – factor

4) Sorption factor

10) Structure separated in the form of strips in an adsorbent column, is called

1) Chromatogram

2) Band

3) Development

4) Distribution

11) Two substances when separated on the basis of partition coefficient between two liquid phases, the technique I sknown as

1) Column chromatography

2) Paper chromatography

3) GLC

4) TLC

12) Steam distillation is used for the extraction of…

1) Essential oil

2) Higher alkynes

3) Mineral oils

4) Fatty acids

13) A mixture of camphor and KCl can be separated by

1) Evaporation

2) Sublimation

3) Filteration

4) Decantation

14) In chromatographyic technique, the relative adsorption of a component in a mixture expressed in terms of its R_f value is defined as

1) Distance moved by solvent from baseline divided by distance moved by the mixture
2) Amount adsorbed by a pure solvent divided by amount adsorbed by the mixture
3) Distance moved by the substance from base line divided by distance moved by solvent from base line
1) Amount adsorbed per gram of stationary phase

15) Select the correct code by matching list I and list II

List-I	List-II
1) Fractional distillation	i) Liquid having sufficient different boiling points
2) Fractional crystallisation	ii) Solid having different solubilities
3) Vacuum distillation	iii) Liquid that decomposes at its boiling point
4) Solvent extraction	iv) Liquids that are immiscible

	A	B	C	D
1)	i	ii	iii	iv
2)	i	iii	ii	iv
3)	ii	i	iii	iv
4)	ii	iv	i	iii

16) A mixture of oil and water is separated by…

1) Filtration

2) Fractional distillation

3) Sublimation

4) Using separating funnel

17) A mixture of camphor and benzoic acid can be easily separated by

1) Sublimation

2) Extraction with solvent

3) Fractional crystallisation

4) Chemical method

18) In a solution, solvent can be separated from solute by one of the following process:

1) Decantation

2) Filtration

3) Distillation

4) Sedimentation

19) Which of the following is useful for making pure water from a solution of salt in water …

1) Filtration

2) Distillation

3) Chromatography

4) Steam distillation

20) Impure glycerin can be purified by:

1) Steam distillation

2) Simple distillation

3) Vacuum distillation

4) Extraction with a solvent

OBJECTIVE QUESTIONS
LEVEL-III

LEVEL - III

1) Kjeldahl's method cannot be used for the estimation of nitrogen in

1) Azo benzene

2) Quinoline

3) Para nitro benzoic acid

4) All of these

2) **Statement I:** Duma’s method is more applicable to nitrogen containing organic compounds than kjeldahl’s method

Statement II: Kjeldahl’s method does not give satisfactory results for compounds in which N is linked to nitrogen

1) Statement I is true, Statement II is true, Statement II is the correct explanation for Statement I

2) Statement I is true, Statement II is true, Statement II is not the correct explanation for Statement I

3) Statement I is true, Statement II is false

4) Statement I is false, Statement II is true

3) Molecular mass of volatile substance may be obtained by

1) Kjeldahl’s method

2) Duma’s method

3) Victory-meyer’s method

4) Liebig’s method

4) 0.75g platinic chloride of a mono-acid base on ignition gave 0.245g platinum. The molecular weight of the base is

1) 75.0 2) 93.5 3) 100 4) 80.0

Solution:

$$\boldsymbol{Molecular\ mass\ of\ base}$$

$$= \frac{1}{2}\left[\boldsymbol{Molar\ mass\ of\ chloroplatinate\ salt - (n \times 410)}\right]$$

$$\boldsymbol{Where\ molar\ mass\ of\ choroplatinate\ salt}$$

$$= \frac{Mass\ of\ chloroplatinate\ salt \times 195}{mass\ of\ platinum\ formed} \times n$$

$$= \frac{0.75 \times 195}{0.245} \times 1 = 597$$

$Where\ n\ is\ acidity\ of\ the\ organic\ base$

$Molar\ mass\ of\ H_2PtCl_6 = 410$

$$molecular\ weight = \frac{1}{2}(597 - 1 \times 410) = 93.5$$

KEY : 2

5) 0.532g of the platinitic chloride of a mono acid organic base left 0.195g of platinum as residue on ignition. The equivalent weight of the base is

1) 32 2) 61 3) 122 4) 115

Solution:

$$\boldsymbol{Molecular\ mass\ of\ base}$$

$$= \frac{1}{2}[\boldsymbol{Molar\ mass\ of\ chloroplatinate\ salt} - (\boldsymbol{n} \times \mathbf{410})]$$

$$\boldsymbol{Where\ molar\ mass\ of\ choroplatinate\ salt}$$

$$= \frac{\boldsymbol{Mass\ of\ chloroplatinate\ salt \times 195}}{\boldsymbol{mass\ of\ platinum\ formed}} \times \boldsymbol{n}$$

$$= \frac{\mathbf{0.532 \times 195}}{\mathbf{0.195}} \times \mathbf{1} = \mathbf{532}$$

$\boldsymbol{Where\ n\ is\ acidity\ of\ the\ organic\ base}$

$\boldsymbol{Molar\ mass\ of\ H_2PtCl_6 = 410}$

$$\textbf{Molar mass} = \frac{1}{2}[\mathbf{532 - (1\ x\ 410)}] = \mathbf{61}$$

$$\boxed{\textbf{E.Wt.} = \frac{\textbf{molar mass}}{\textbf{acidity}} = \frac{\mathbf{61}}{\mathbf{1}} = \mathbf{61}}$$

KEY : 2

6) 59g of an amide obtained from a carboxylic acid, RCOOH, upon heating with alkali liberated 17g of ammonia. The acid is

1) Formic acid

2) Acetic acid

3) Propionic acid

4) Benzoic acid

Solution:

$$R\,COOH + NH_3 \rightarrow R\,CONH_2 + H_2O$$

$$R\,CONH_2 + NaOH \rightarrow R\,COONa + NH_3$$

7) If the percentage of nitrogen in an organic compound is 12.5%, then how much of the organic compound should be taken so as to produce 50 mL of N_2 at 300K and 715mm pressure (Aq. Tension=15mm).

1) 0.419g

2) 0.0149g

3) 0.914g

4) 0.941g

Solution:

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \Rightarrow \frac{760 \times V_1}{273} = \frac{700 \times 50}{300} \Rightarrow V_1 = 41.9ml$$

$$\%N = \frac{28}{22,400} \times \frac{vol\ of\ N_2}{wt\ of\ OC} \times 100$$

$$\Rightarrow 12.5 = \frac{28}{22,400} \times \frac{41.9}{wt\ of\ OC} \times 100$$

$$wt\ of\ OC = \frac{28}{22,400} \times \frac{41.9}{12.5} \times 100 = 0.419$$

KEY : 1

8) 0.2475g of an organic compound gave on combustion 0.4950g of carbon dioxide and 0.2025g of water. The percentage of carbon and hydrogen are

1) 54.54, 9.09

2) 52.54, 8.09

3) 120, 5.8

4) 12, 58

Solution:

$$\%C = \frac{12}{44} \times \frac{wt\ of\ CO_2}{wt\ of\ OC} \times 100 \Rightarrow \frac{12}{44} \times \frac{0.4950}{0.2475} \times 100 = 54.54$$

$$\%H = \frac{2}{18} \times \frac{wt\ of\ H_2O}{wt\ of\ OC} \times 100 \Rightarrow \frac{2}{18} \times \frac{0.2025}{0.2475} \times 100 = 9.09$$

9) In a Dumas nitrogen estimation 0.3g of an organic compound gave 50 cm^3 of nitrogen collected at 300 K and 715mm pressure. The percentage of nitrogen in the compound (vapour pressure of water at 300K is 15mm) is

1) 15.46 2) 17.46 3) 50 4) 70

Solution:

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \Rightarrow \frac{760 \times V_1}{273} = \frac{700 \times 50}{300} \Rightarrow V_1 = 41.9$$

$$\%N = \frac{28}{22,400} \times \frac{vol\ of\ N_2}{wt\ of\ OC} \times 100 = \frac{28}{22400} \times \frac{41.9}{0.3} \times 100 = 17.46$$

10) 0.257 g of an organic substance was heated with conc H_2SO_4 and then distilled with excess of strong alkali. The ammonia gas evolved was absorbed in 50ml of N/10 HCl which required 23.2 ml of N/10 NaOH for neutralization at the end of the process. The percentage of nitrogen in the compound is

1) 14.6 2) 18.0 3) 17.0 4) 15.5

Solution:

$$N = \frac{N_a V_a - N_b V_b}{V_a + V_b} = \frac{(50 \times 0.1) - (23.2 \times 0.1)}{73.2} = 0.0366$$

$$\%N = \frac{1.4 \times N \times V}{wt\ of\ OC} = \frac{1.4 \times 0.0366 \times 73.2}{0.257} = 14.6$$

11) 0.15g of an organic compound gave 0.12g of AgBr by Carius method. The percentage of bromine in the compound is

1) 43   2) 54   3) 34   4) 66

Solution:

$$\%Br = \frac{80}{188} \times \frac{wt\ of\ AgBr}{wt\ of\ OC} \times 100$$

$$= \frac{80}{188} \times \frac{0.12}{0.15} \times 100 = 34$$

12) 0.395g of an organic compound by Carius method for the estimation of sulphur gave 0.582 g of BaSO_4. The percentage of sulphur in compound is

1) 20.24 2) 35 3) 40 4) 45

Solution:

$$\%S = \frac{32}{233} \times \frac{wt.of\ BaSO_4}{wt.of\ O.C} \times 100$$

$$= \frac{32}{233} \times \frac{0.582}{0.395} \times 100 = 20.24$$

13) Ina victor Meyer's method, 0.170 g of a liquid displaced 59.2 cm^3 of air at 300K and 746 mm pressure. The molecular mass of the liquid is (aq. Tension at 300K = 26.5 mm)

1) 74.67 2) 84 3) 65 4) 35

Solution:

$$PV = \frac{w}{M}RT \Rightarrow \frac{719.5}{760} \times \frac{59.2}{1000} = \frac{0.170}{M} 0.0821 \times 300$$

$$M = \frac{0.170 \times 0.0821 \times 300}{0.946 \times 0.0592} = 74.67$$

14) 0.183 g of an aromatic monobasic acid required 15ml of decinormal sodium hydroxide for complete neutralization. The molecular mass of the acid is

1) 74.67 2) 122 3) 65 4) 7.46

Solution:

$$\frac{wt}{G.E.W} = \frac{V \times N}{1000}$$

$$\frac{0.183}{G.E.W} = \frac{15 \times 0.1}{1000} = 122$$

Molecular mass = E.Wt × basicity = 122 × 1 = 122

21) Azeotropic mixtures :

1) Boil at different temperatures

2) Are mixture of solids

3) Are constant component boiling mixtures

4) Are none of the above

22) Glycerol decomposes at its boiling point, the purification of gycerol can be affected by

1) Crystallisation

2) Simple distillation

3) Distillation under reduced pressure

4) Fractional crystallisation

23) Raw juice is generally concentrated by

1) Vacuum distillation

2) Steam distillation

3) Both 1 and 2

4) Simple distillation

24) For which of the following compounds steam distillation can be used for purification

1) P Hydroxyphenol

2) Phenol

3) Salicylildehyde

4) All of these

25) Sugar containing an impurity of common salt can be purified by crystallisation from…

1) Benzene

2) Alcohol

3) Petroleum ether

4) Water

26) Turpentine oil can be purified for

1) Vacuum distillation

2) Fractional distillation

3) Steam distillation

4) Simple distillation

27) Ellution is the process for …

1) Crystallization of compound

2) Separation of compound

3) Extraction of compound

4) Distillation of compound

28) Which of the following technique is most suitable for purification of cyclohexanone from a mixture containing benzoic acid, isoamyl alcohol, cyclohexane and cyclohexanone

1) Crystallisation

2) IR spectroscopy

3) Sublimation

4) Gas chromatography

29) The most satisfactory method of separating sugars from each other is

1) Fractional crystallisation

2) Sublimation

3) Chromatography

4) Benedict solution

QUALITATIVE ANALYSIS :

30) Diethyl ether is mostly used in solvent extraction due to all of the following reasons except

1) Its solvation capacity is very high

2) Being inert, it does not react with most organic compound

3) There are two lone pairs in it, therefore it acts as a strong nucleophile

4) Its boiling point is low, therefore it can be easily separated by distillation

31) The prussian blue colour obtained during the test of nitrogen by Lassaigne's test is due to the formation of:

1) $Fe_4[Fe(CN)_6]_3$

2) $Na_4[Fe(CN)_6]$

3) $Fe_3[Fe(CN)_6]_4$

4) $Fe_2[Fe(CN)_6]$

32) For the detection of sulphur in an organic compound sodium nitroprusside is added to the sodium extract. A violet color is obtained due to formation of

1) $Fe(CN)_2$

2) $K_3Fe(CN)_5NS$

3) $Na_4[Fe(CN)_5NOS]$

4) $Na_4[Fe(CN)_6]$

33) In Carius tube the compound ClCH_2 COOH was heated with fuming HNO_3 and AgNO_3. After filtration and washing a white ppt. was normed. The ppt. is

1) AgCl

2) AgNO_3

3) Ag_2SO_4

4) $CH_2(Cl)COOAg$

34) Which of the following sodium compound/compounds are formed when an organic compound containing both nitrogen and sulphur is fused with sodium?

1) Cyanide and sulphide

2) Thiocyanate

3) Sulphite and cyanide

4) Nitrate and sulphide

35) Which of the following compound will give blood red colour while doing the Lassaigne's test for N

1) $(NH_2)_2C = O$

2) $H_2N(C_6H_4)SO_3H$

3) $C_6H_5SO_3H$

4) $CHCl_3$

36) When an organic compound contain phosphorus is fused with fusion mixture, gives

1) Na_2HPO_4

2) Na_3PO_4

3) NaH_2PO_4

4) Na_3PO_3

37) Copper wire test of halogens is known as:

1) Liebig’s test

2) Lassaigne’s test

3) Fusion test

4) Beilstein’s test

38) Beilstein's test is given by which of the following

1) Halogens

2) Thio urea

3) Pyridine

4) All

39) In Lassaigne's test thio urea is converted into

1) NaCNS

2) Na_2S

3) NaCN

4) Na_2SO_4

40) Positive Beilstein test shows that

1) Halogen is surely present

2) Halogen is absent

3) Halogen may be present

4) Hydrogen is present

41) **For which of the following compounds the Lassaign's test of nitrogen will fail**

1) H_2NCONH.NH_2.HCl

2) $H_2N.NH_2.2HCl$

3) H_2NCONH_2

4) $C_6H_5 - N = N \ C_6H_5$

42) Which is useful for separating benzoic acid from a mixture of benzoic acid and methyl benzoate

1) Aq. $NaHCO_3$

2) Dil. HCl

3) Dil. H_2SO_4

4) Dil. HNO_3

QUANTITATIVE ANALYSIS

43) In Kjeldahl's method, $CuSO_4$ acts as

1) Oxidising agent

2) Catalytic agent

3) Reducing agent

4) Hydrolysing agent

44) 0.2g of an organic compound on complete combustion produces 0.44g of CO_2, then the percentage of carbon in it is

1) 50 2) 60 3) 70 4) 80

Solution:

$$\%C = \frac{12}{44} \times \frac{wt\ of\ CO_2}{wt\ of\ OC} \times 100$$

$$\%C = \frac{12}{44} \times \frac{0.44}{0.2} \times 100$$

$= 60$

45) 0.765g of an organic compound on combustion gave 0.535g of CO_2 and 0.138g of H_2O. Then the ratio of the percentage of carbon and hydrogen is

1) 19:2 2) 18:11 3) 20:17 4) 1:7

Solution:

$$C\% = \frac{12}{44} \times \frac{wt\ of\ CO_2}{wt\ of\ OC} \times 100 = \frac{12}{44} \times \frac{0.535}{0.765} \times 100 = 19$$

$$H\% = \frac{2}{18} \times \frac{wt\ of\ H_2O}{wt\ of\ OC} \times 100 = \frac{2}{18} \times \frac{0.138}{0.765} \times 100 = 2$$

46) 0.24g of a volatile liquid on vaporization gives 45ml of vapours at NTP. What will be the vapour density of the substance? (Density of H_2=0.089gL^{-1})

1) 95.39 **2) 39.35** **3) 99.53** **4) 59.73**

Solution:

$$0.24\ grams \rightarrow 45ml$$

$$? \leftarrow 11200ml$$

$$\frac{11200}{45} \times 0.24 = 59.73$$

47) 0.5g of an organic compound containing nitrogen liberated 112 ml of N_2 gas at S.T.P in Dumas method. The percentage of nitrogen in that organic compound is

1) 14 **2) 56** **3) 28** **4) 7**

Solution:

$$\%N = \frac{28}{22,400} \times \frac{vol\ of\ N_2}{wt\ of\ OC} \times 100$$

$$\%N = \frac{28}{22,400} \times \frac{112}{0.5} \times 100 = 28$$

48) 0.5g of an organic compound containing nitrogen on kjeldhlizing required 29ml of N/5 H_2SO_4 for complete neutralization of ammonia. The percentage of nitrogen in the compound is

1) 34.3　　2) 16.2　　3) 21.6　　4) 14.8

Solution:

$$\%N = \frac{1.4 \times N \times V}{wt\ of\ OC}$$

$$= \frac{1.4 \times 0.2 \times 29}{0.5} = 16.24$$

49) 0.59g of an organic substance when treated with caustic soda evolved ammonia which required 20 cc of N/2 sulphuric acid for neutralisation. The percentage of nitrogen of is

1) 23.73% 2) 40% 3) 53.6% 4) 63.6%

Solution:

$$\%N = \frac{1.4 \times N \times V}{wt\ of\ OC}$$

$$= \frac{1.4 \times 0.5 \times 20}{0.59} = 23.72$$

50) The percentage of sulphuric in an organic compound whose 0.32g produces 0.233g of BaSO_4 [At. Wt. Ba = 137, S = 32] is

1) 1.0 2) 10.0 3) 23.5 4) 32.1

Solution:

$$\%S = \frac{32}{233} \times \frac{wt\ of\ BaSO_4}{wt\ of\ OC} \times 100$$

$$= \frac{32}{233} \times \frac{0.233}{0.32} \times 100 = 10$$

51) 0.5g of an organic compound containing phosphorous precipitated 0.444g of $Mg_2P_2O_7$. The percentage of phosphorous in that organic compound is

1) 12.4 2) 24.8 3) 49 4) 75

Solution:

$$\%P = \frac{62}{222} \times \frac{wt\ of\ Mg_2P_2O_7}{wt\ of\ OC} \times 100$$

$$= \frac{62}{222} \times \frac{0.444}{0.5} \times 100 = 24.8$$

52) 2.79g of an organic compound when heated in Carious tube with concentrated HNO_3 and H_3PO_4 formed converted into Mg NH_4 .P O_4 ppt. On heating gave 1.332g of $Mg_2P_2O_7$. The percentage of P in the compound is

1) 23.33 2) 13.33 3) 33.33 4) 26.66

Solution:

$$\%P = \frac{62}{222} \times \frac{wt\ of\ Mg_2P_2O_7}{wt\ of\ OC} \times 100$$

$$= \frac{62}{222} \times \frac{1.332}{2.79} \times 100 = 13.33$$

OBJECTIVE QUESTIONS
PCQS

1) Which of the following can be used to separate a mixture of ortho & para-nitro phenols? (Medical - 2014)

1) Crystallisation
2) Solubility
3) Sublimation
4) Steam distillation

Solution:

In the ortho compound intra molecular hydrogen bond present. In the para compound inter molecular hydrogen bond present. Therefore boiling point of orthocompound less than paracompound.

2) In the estimation of halogen, 0.18 grms of an organic compound gave, 0.12 grms of AgBr. What is the percentage of bromine in the compound (molar mass of AgBr = 188, atomic weight of Br=80)

(Medical - 2014)

1) 35.24   2) 34.84   ✔ 3) 28.36   4) 30.64

Solution:

$$\%Br = \frac{80}{188} \times \frac{\text{wt. of AgBr}}{\text{wt of O.C}} \times 100$$

$$= \frac{80}{188} \times \frac{0.12}{0.18} \times 100 = 28.36$$

3) For the estimation of nitrogen, 1.4g of an organic compound was digested by Kjeldahl method and the evolved ammonia was absorbed in 60 mL of $\frac{M}{10}$ sulphuric acid. The unreacted acid required 20 mL of $\frac{M}{10}$ sodium hydroxide for complete neutralization. The percentage of nitrogen in the compound is: [JEEMAINS - 2014]

1) 6%   2) 10%   3) 3%   4) 5%

Solution:

$$\%\ of\ N = \frac{1.4 \times no.of\ mil.eq.of\ H_2SO_4\ used}{wt\ of\ org.compound}$$

$$\Rightarrow no.of\ mil.eq.of\ H_2SO_4\ used =$$

$$60 \times 2 \times \frac{1}{10} - 20 \times \frac{1}{10} = 10\%$$

KEY : 2

4) For which of the following compounds Kjeldahl's method can be used to determine the percentage of Nitrogen? [J.M.O.L - 2013]

1) Alanine

2) Nitrobenzene

3) Pyridine

4) Diazomethane

Solution:

Alanine is amino acid it has C-NH_2 which can be converted into ammonia gas in Kjeldhal's method

Hence can be estimated

5) Carbon and hydrogen in an organic compound are detected as___

(M - 2013)

1) $CaCO_3, Cu(OH)_2$

2) $CaHCO_3, CaCO_3$

3) $CaHCO_3, CuSO_4.5H_2O$

✔ 4) $CaCO_3, CuSO_4.5H_2O$

Solution:

$$C + 2CuO \xrightarrow{heat} CO_2 + 2Cu$$

$$Ca(OH)_2 + 2CO_2 \xrightarrow{heat} CaCO_3 \downarrow + 5H_2O$$

$$2H + CuO \xrightarrow{heat} H_2O + Cu$$

$$CuSO_4 + 5H_2O \xrightarrow{heat} CuSO_4 + 5H_2O$$

6) Which one of the following gives prussian blue colour? (E - 2013)

1) $Fe_2[Fe(CN)_6]$

2) $Na_4[Fe(CN)_6]$

3) $Fe_3[Fe(CN)_6]_3$

4) $Fe_4[Fe(CN)_6]_3$

Solution:

prussian blue formula is $Fe_4[Fe(CN)_6]_3$

7) The compound formed in the positive test for nitrogen with the Lassaigne solution of an organic compound is (AIEE 2004)

1) $Fe_4[Fe(CN)_6]_3$

2) $Na_3[Fe(CN)_6]$

3) $Fe(CN)_3$

4) $Na_3[Fe(CN)_5NOS]$

Solution:

N_2 is converted to prussian blue, formula is $Fe_4[Fe(CN)_6]_3$

8) The ammonia evolved from the treatment of 0.30g of an organic compound for the estimation of Nitrogen was passed into 100ml of 0.1 M sulphuric Acid. The excess of acid required 20 ml of 0.1M sodium hydroxide solution for complete neutralization. The percentage of nitrogen in the organic compound is (AIEEE 2004)

1) 84% 2) 50% 3) 42% 4) 14%

Solution:

$$\frac{M_1V_1}{n_1} = \frac{M_2V_2}{n_2} \Rightarrow V_1 = \frac{0.1 \times 20 \times 1}{0.1 \times 2} = 10 \Rightarrow V = 100 - 10 = 90$$

$$\%N = \frac{1.4 \times N \times V}{wt\ of\ OC} = \frac{1.4 \times 0.2 \times 90}{0.30} = 84$$

9) In a compound C, H and N atoms are present in 9 : 1 : 3.5 by weight. Molecular weight of compound is 108. Molecular formula of compound is. (AIEEE 2002)

1) $C_2H_6N_2$

2) C_3H_4N

3) $C_6H_8N_2$

4) $C_9H_{12}N_3$

10) Copper wire test for halogens is known as:

1) Beilstein's test

2) Duma's test

3) Liebig's test

4) Lassaigne's test

Solution:

$Belistein's\ test\ is\ for\ halogens$

11) 1.4 g of an organic compound was digested according Kjeldahl's method and the ammonia evolved was absorbed in 60 mL. of M/10 H_2SO_4 solution. The excess sulphuric acid required 20 mL. of M/10 NaOH solution for neutralization. The percentage of nitrogen in the compound is: [J.O.L - 2015]

1) 3 2) 5 3) 10 4) 24

Solution:

$$\text{Volume of acid reacted with } NH_3 = \text{Total volume of acid taken} - \text{volume of acid reacted with base}$$

20 mL of M/10 NaOH = 10 mL of M/10 H_2SO_4

Volume of acid reacted with $NH_3 = 60 - 10 = 50\text{mL}$

Normality of $H_2SO_4 = \text{Molarity} \times 2 = 0.1 \times 2 = 0.2$

$$N\ \% = \frac{1.4 \times N \times V}{wt\ of\ OC}$$

$$= \frac{1.4 \times 0.2 \times 50}{1.4} = 10$$

KEY : 3

12) In Carius method of estimation of halogens, 250 mg of an organic compound gave 141 mg of AgBr. The percentage of bromine in the compound is: (at. Mass Ag=108; Br=80) [JEEMAINS - 2015]

1) 24 **2) 36** **3) 48** **4) 60**

Solution:

$$Br\,\% = \frac{80}{188} \times \frac{wt.\,of\ AgBr}{wt\ of\ oc} \times 100$$

$$Br\,\% = \frac{80}{188} \times \frac{141}{250} \times 100 = 24$$

OBJECTIVE QUESTIONS
LEVEL-I

LEVEL - I

1) Vital force theory was proposed by…

1) Wohler

2) Berzelius

3) Van’t Hoff

4) Le bel

2) Vital force theory was disapproved by

1) Rutherford

2) Bohr

3) Berzelius

4) Wohler

3) Urea was prepared first time in the laboratory by heating …

1) Ammonium cyanate

2) Ammonium cyanide

3) Ammonium cyanite

4) Ammonium isocyanide

4) **The first carbon compound prepared from its elements is…**

1) **Urea**

2) **Acetic acid**

3) **Methane**

4) **Benzene**

5) Organic compounds are numerous since

1) Carbon has high catenation ability

2) Tetravalency of carbon

3) Isomerism of organic compounds

4) All

6) Alicyclic compounds are…. In nature

1) Aromatic

2) Aliphatic

3) Both 1 and 2

4) Complexes

7) Heterocyclic compounds are …. in nature

1) Aliphatic

2) Aromatic

3) Aliphatic or Aromatic

4) Inorganic

8) Pyrrole is

1) An acyclic compound

2) An unsaturated aliphatic compound

3) An alicyclic compound

4) A heterocyclic aromatic compound

9) **Pyridine is…**

1) Heterocyclic compound

2) Unsaturated compound

3) Carbocyclic compound

4) Homocyclic compound

10) An example of alicyclic compound is…

1) Benzene

2) Hexane

3) Cyclohexane

4) Furan

11) An example of acyclic compound is…

1) Benzene

2) Hexane

3) Cyclohexane

4) Furan

12) **In homologous series, the consecutive members differ in structural formula by**

1) CH

2) CH_3

3) CH_2

4) C_6H_6

13) **Pick out a set of homologues…**

1) C_2H_6, C_2H_4, C_2H_2, C_2H_5

2) C_6H_6, C_7H_8, C_9H_{10}, C_9H_{12}

3) CH_4, C_2H_6, C_3H_8, C_4H_{10}

4) C_2H_2, C_3H_4, C_4H_9, C_4H_{10}

14) According to Huckel's rule, a compound is said to be aromatic if it contains …

1) (4n+2) π bonds

2) (4n+2) σ bonds

3) (4n+2)C - atom

4) (4n+2) π electrons

15) Which of the following is alicyclic compound?

1) Cyclopentanol

2) Cyclohexane

3) Benzene

4) Both 1 and 2

16) Which of the following is an aromatic compound….

1) Phenol

2) Naphthalene

3) Pyridine

4) All

17)Which of the following is not a heterocyclic organic compound?

1) Furan

2) Thiophene

3) Pyrrole

4) Cyclohexane

18) **Which of the following molecular formula belongs to the alkynes series?**

1) C_7H_{14}

2) $C_{10}H_{22}$

3) C_9H_{16}

4) $C_{16}H_{32}$

19) Which of the following statements is wrong?

1) In a general organic compounds have low m.pt and b.pt

2) Isomerism is common in organic compounds

3) Organic compounds cannot be synthesized in the laboratory

4) The number of organic compounds is very large

20) The minimum number of carbon atoms which a cycloalkane contain

1) 1

2) 2

3) 3

4) 4

BONDING

21) Energy required for the excitation of carbon atoms is…

1) 501.6 KJ/ mole

2) 827.0 KJ/ mole

3) 341.0 KJ/ mole

4) 610.0 KJ/ mole

22) The number of hybrid and unhybridised orbitals in ethane respectively are

1) 2 and 6

2) 6 and 6

3) 6 and 8

4) 8 and 6

23) The number of hybrid and unhybridised orbitals in ethene respectively is…

1) 8 and 6

2) 6 and 6

3) 2 and 4

4) 4 and 2

24) The number of hybrid and unhybridised orbitals in ethyne respectively are

1) 2 and 2

2) 2 and 6

3) 4 and 6

4) 6 and 4

25) **The hybridization of carbon atoms in C-C single bond of $HC \equiv C - CH = CH_2$ are…**

1) sp^3 - sp^3

2) sp^2 - sp^3

3) sp - sp^2

4) sp^3 - sp

26) An sp^3-hybrid orbital contains

1) 1/4 s-character

2) 1/2 s-character

3) 1/3 s-character

4) 2/3 s-character

27) Which of the following statement is not correct?

1) **Double bond is shorter than a single bond**

2) **Sigma bond is weaker than a π(pi) bond**

3) **Double bond is stronger than a single bond**

4) **Covalent bond is stronger than hydrogen bond**

28) Which of the following compounds does not contain a double bond or a triple bond?

1) C_2H_2

2) H_2O

3) N_2

4) HCN

29) The cylindrical shape of alkynes is due to

1) Three sigma C-C bonds

2) Three π C-C bonds

3) Two σ C-C and one π C-C bonds

4) one sigma C-C and one π C-C bonds

30) Which one is false in the following statements?

1) Each carbon in ethylene is in sp^2 -hybridization

2) Each carbon in acetylene is in sp-hybridization

3) Each carbon in benzene is in sp^2 -hybridization

4) Each carbon in ethane is in sp^2-hybridization

31) **Select the molecule which has only one π bond…**

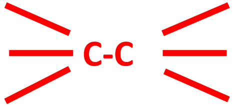
1) C_2H_2

2) C_3H_4O

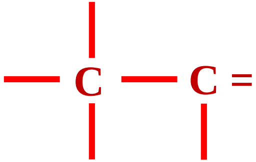
3) C_3H_6

4) $C_4H_6O_2$

32) Which of the following bonds is strongest?

1) 

2) $> C = C <$

3) 

4) $- C \equiv C -$

33) The hybridization involved in six carbon atoms of benzene is

1) Three sp^3 and three sp^2

2) All six sp

3) Three sp^2 and three sp

4) All six sp^2

34) sp^3 -hybridization leads to which shape of the molecule?

1) Tetrahedral

2) Octahedral

3) Linear

4) Trigonal planar

35) Which of the following has maximum C-H bond length?

1) C_2H_4

2) C_2H_2

3) C_2H_6

4) C_6H_6

36) **Bond angle in ethene is**

1) 120^0

2) 180^0

3) $109^0 28^1$

4) 111

37) The number of hybrid orbitals in ethylene are

1) 2

2) 4

3) 6

4) 8

38) The type of overlapping present between two carbon atoms of acetylene is…

1) σ sp-sp

2) σ $sp^2 – sp^2$

3) σ $sp^3 – sp^3$

4) σ sp^3 - sp

39) Carbon shows maximum capacity of catenation because

1) Carbon shows variable valency

2) C-C bond strength is very low

3) In carbon there is one extra empty d-orbital

4) C-C bond strength is very high

40) The shortest C-C bond distance is found in

1) Diamond

2) Ethane

3) Benzene

4) Acetylene

41) When the hybridization state of carbon atom changes from sp^3 and sp^2 and finally to sp, the angle between the hybridized orbitals

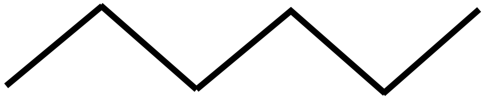
1) Decreases gradually

2) Decreases considerably

3) Is not affected

4) Increases progressively

STRUCTURE FORMULAE

42)  **Is the structure of**

1) n-Hexane

2) Butane

3) Cyclo Hexane

4) pentane

43)  Comes under the family of

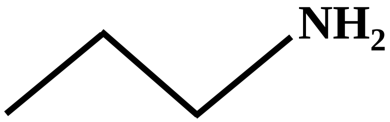
1) Alkenes

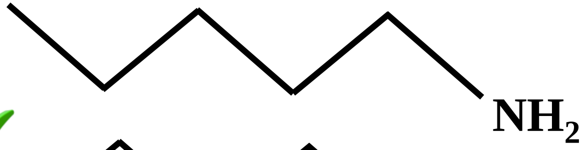
2) Cyclo alkenes

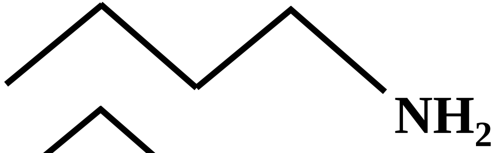
3) Alkanes

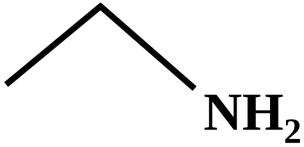
4) Alkynes

44) Butanamine-1 structure is shown as…

1) 

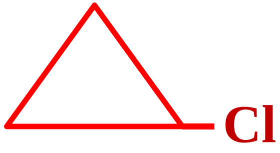
2) 

3) 

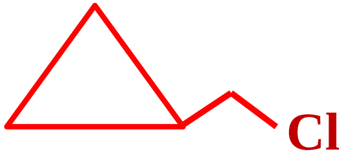
4) 

45) Chloro cyclo propane is written as

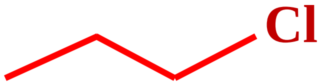
1)



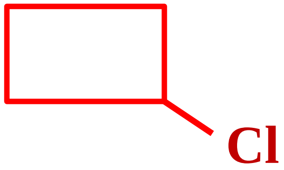
2)

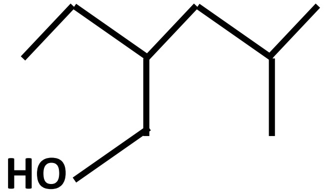


3)



4)



46) 

Structure is

1)

$$\begin{array}{l} \qquad\qquad\qquad\qquad\qquad\qquad\quad CH_3 \\ \qquad\qquad\qquad\qquad\qquad\qquad\quad | \\ H_3C - CH_2 - \underset{\underset{H_2C - OH}{|}}{CH} - CH_2 - CH - CH_3 \end{array}$$

2)

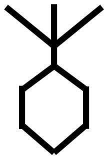
$$\begin{array}{l} \qquad\quad OH \qquad\qquad\qquad\qquad\qquad\quad CH_3 \\ \qquad\quad\ | \qquad\qquad\qquad\qquad\qquad\qquad | \\ H_3C - CH - \underset{\underset{\underset{\underset{CH_2}{|}}{CH_2}}{|}}{CH_2} - CH_2 - CH - CH_3 \end{array}$$

3)

$$H_3C - CH_2 - CH_2 - \underset{\underset{OH}{|}}{CH_2} - CH_2 - CH_3$$

4)

$$H_3C - \overset{\overset{OH}{|}}{CH_2} - CH = CH - CH_3$$

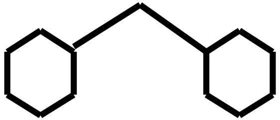
47)  **Contains how many carbon atoms?**

1) 9

2) 10

3) 11

4) 8

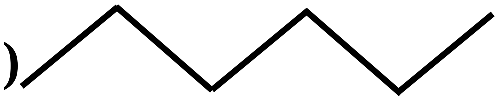
48)  Contains how many hydrogen atoms?

1) 13

2) 12

3) 24

4) 14

49)  Contains how many 2^0 carbons?

1) 1

2) 2

3) 3

4) 4

50) The number of carbon atoms arranged linearly in the molecule

$$CH_3 - C \equiv C - CH = CH_3$$

1) 5

2) 4

3) 3

4) 2

OBJECTIVE QUESTIONS
LEVEL-II

LEVEL - II

1) Correct statements about homologous series…

a) Adjacent members of a group differ by a mass of 14

b) Adjacent members of group differ by one $-CH_2$ group

c) Members of homologous series can be prepared by the same general methods

d) Members of homologous series have same physical and chemical properties

Correct statement about homologous series…

The correct combination is

1) c, d

2) b, d

3) a, b, c

4) All are correct

2) Which of the following compounds will have only 1^0 and 2^0

i) Propane

ii) 2, 2, 3 trimethyl pentane

iii) 2 methyl propane

iv) n-propyl bromide

The correct combination is

1) All are correct

2) ii, iv

3) i, iv

4) ii, iii

3) The degree of unsaturation in pyridine molecule is…

1) 4

2) 3

3) 4

4) 2

4) The correct combination from following is

i) The first organic compound synthesised from it’s constituent elements is urea

ii) Higher catenation ability of carbon is due to greater C-C bond energy

iii) The C-C bond length in C_6H_6 is shorter than that of C-C single bond length and greater than C-C double bond length

iv) The bond length of C-C bond is equal in ethylene and benzene

1) i and ii

2) ii and iii

3) iii and iv

4) I, ii and iii

5) The correct combination among the following is

i) Benzene is alicyclic and aromatic

ii) Benzene is homocyclic and aromatic

iii) Benzene is carbo cyclic and aromatic

iv) Benzene is acyclic and aromatic

1) i and ii

2) ii and iii

3) iii and iv

4) i, ii and iii

BONDING

6) C-H bond type in benzene is

1) **σ sp - s**

2) **σ sp^2 - s**

3) **σ sp^3 - s**

4) **σ p - p**

7) Hybridisation of 2nd carbon in $CH_2=CH - CH_3$ is

1) sp

2) sp^2

3) sp^3

4) sp^3d

8) Hybridisation of carbon atom in CH_3^+ is

1) sp

2) sp^2

3) sp^3

4) sp^3d

9) Which hybrid orbitals are involved in the CH_3-$CH = CH – CH_3$ compound

1) sp and sp^3

2) sp^2 and sp^3

3) sp and sp^2

4) only sp^3

10) The ratio of σ and π bonds in benzene is

1) 3 : 1

2) 4 : 1

3) 1 : 4

4) 2 : 3

11) The ratio of pure and hybrid orbitals $H_2C = CH - CH = CH_2$

1) 7 : 12

2) 14 : 13

3) 6 : 5

4) 5 : 6

12) **Which of the following does not contains all carbons sp^2 hybridised?**

1) C_2H_4

2) C_6H_6

3) $CH_2 = CH - CH = CH_2$

4) $CH \equiv C - C \equiv CH$

13) Total numbers of hybrid orbitals present in $CH_2 = C = CH_2$ is...

1) 8

2) 6

3) 4

4) 2

14) Number of **σ** and **π** bonds present in a compound of molecular formula C_nH_{2n}

1) (3n + 1), 2

2) (3n - 1), 2

3) (3n - 1), 1

4) (3n - 3), 1

15) The bond length of C – C in hydrocarbons follow the order

1) $C_2H_6 > C_6H_6 > C_2H_4 > C_2H_2$

2) $C_2H_6 > C_2H_4 > C_2H_2 > C_6H_6$

3) $C_2H_2 > C_2H_4 > C_2H_6 > C_6H_6$

4) $C_6H_6 > C_2H_2 > C_2H_4 > C_2H_6$

16) **The bond energy of C – C in hydrocarbon follow the order**

1) $C_6H_6 < C_2H_2 < C_2H_4 > C_2H_6$

2) $C_2H_2 < C_2H_4 < C_2H_6 > C_6H_6$

3) $C_2H_6 < C_2H_4 < C_2H_2 > C_6H_6$

4) $C_2H_6 < C_6H_6 < C_2H_4 > C_2H_2$

17) The number of σ and π bonds between two carbon atoms of propyne are respectively

1) 6, 2

2) 1, 2

3) 2, 1

4) 2, 2

18) Hybridisation of terminal carbons in But-2-ene is…

1) sp^2

2) sp^3

3) sp

4) sp^3d

19) During pyrolysis of higher alkanes C – C bond breaks faster than the C-H bond because

1) C – C bond is stronger

2) C – H bond is weaker

3) C – C bond involves pi bond in alkane

4) The bond energy of C – C bond is less than that of C – H bond

20) Which statement is correct about the hybridization of carbon atoms in

$$\overset{1}{HC} \equiv \overset{2}{C} - \overset{3}{C} \equiv \overset{4}{CH}$$

1) C_1 and C_4 are sp^2 hybridised

2) C_2 and C_3 are sp^2 hybridised

3) All are sp hybridized

4) All are sp^2 hybridised

21) Select the molecule having degree of unsaturation equal to two

1) CH = CH

2) CH = C - CHO

3) Both 1 and 2

4) $CH_3 - CH = CH_2$

22) Among the following which one has more than one kind of hybridization?

i) $CH_3CH_2CH_2CH_3$

ii) $CH_3CH = CHCH_3$

iii) $CH_2 = CH - C \equiv CH$

iv) $CH \equiv CH$

1) ii and iii

2) ii and i

3) iii and iv

4) iv

23) A hydrocarbon contains no multiple bond but has cyclic structures, such a compound can be grouped under

1) Alkane

2) Aromatic compound

3) Alkene

4) Alicyclic compound

24) Number of tertiary carbon atoms in tertiary butyl alcohol is…

1) 1

2) 2

3) 3

4) 4

25) A secondary (2^0) carbon atom is one that is joined to

1) 1 – alkyl group

2) 2 – alkyl groups

3) 3 – alkyl groups

4) 4 – alkyl groups

26) The number of 4^0 carbon atoms in 2, 2, 3, 4 – tetramethyl pentane

1) 1

2) 2

3) 3

4) 4

27) In which of the following compounds, all the ‘C’ atoms are sp^3 hybridized?

i) CH_4 ii) C_2H_6 iii) C_3H_8 iv) C_4H_{10}

1) i, ii, iii

2) ii, iv

3) iii, iv

4) All are correct

28) The hybridization between carbon atom (1) and carbon atom (2) in the compound given below is

$$N \equiv \overset{1}{C} - \overset{2}{C}H = \overset{3}{C}H_2$$

1) sp^2 and sp^2

2) sp^3 and sp

3) sp and sp^2

4) sp and sp

29) Which of the following has all carbon atoms sp – hybridized?

1) $CH_3 - CH = CH - CH_3$

2) $CH_3 - C \equiv C - C\,H_3$

3) $HC \equiv C - C \equiv CH$

4) All the three above

30) The CI – C – CI angle in 1, 1, 2, 2 tetrachloroethene and tetrachloromethane respectively will be about

1) 120^0 and 109.5^0

2) 90^0 and 109.5^0

3) 109^0 and 90^0

4) 109.5^0 and 120^0

31) What hybrid orbitals will form the following compound?

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

1) Sp and sp^3

2) Sp^2 and sp^3

3) Sp and sp^2

4) Only sp^3

32) Number of π-electrons in naphthalene is

1) 4

2) 3

3) 10

4) 14

33) **Number of π-electrons in cyclobutadiene….**

1) 2

2) 6

3) 4

4) 8

34) Which of the following carbon atoms is most electronegative?

$$\overset{\mathrm{III}}{\mathrm{C}H_3} - \overset{\mathrm{II}}{\mathrm{CH_2}} - \overset{\mathrm{I}}{\mathrm{C}} \equiv \mathrm{CH}$$

1) II

2) I

3) III

4) All are equal

35) In which of the following, the bond length between carbon and carbon is equal

1) 2-Butene
2) Benzene
3) 1-Butene
4) Propyne

36) The bond length between sp^3 - hybridized carbon and other carbon atom is minimum in

1) Propane

2) Propyne

3) Propene

4) Butane

37) The percentage of s-character of the hybrid orbitals in ethane, ethene and ethyne are respectively.

1) 50, 75, 100

2) 10, 20, 40

3) 25, 33, 50

4) 25, 50, 75

38) The number of π- and σ- bonds in benzene is…

1) $3\ \pi + 12\sigma$

2) $12\ \pi + 12\ \sigma$

3) $6\ \pi + 11\ \sigma$

4) $6\ \pi + 6\ \sigma$

OBJECTIVE QUESTIONS
LEVEL-III

LEVEL - III

1) The % increase of s-character in the hybrid orbitals of carbon in CH_4, C_2H_4, C_2H_2 follow the order

1) $CH_4 > C_2H_4 > C_2H_2$

2) $C_2H_4 < CH_4 < C_2H_2$

3) $CH_4 < C_2H_4 < C_2H_2$

4) $C_2H_2 < C_2H_4 < CH_3$

2) Which compound given below has sp^3, sp^2 and sp orbitals in the ratio of 6 : 3 : 2

1) $CH_3 - CH = CH - CH_2 - C \equiv C - CH_3$

2) $CH_3 - CH = CH - CH_2 - C \equiv CH$

3) $CH_3 - CH_2 - C \equiv C - CH = CH_2$

4) $CH_3 - CH = CH - C \equiv CH$

3) The number of π electrons present in anthracene

1) 6

2) 10

3) 5

4) 14

4) The total number of hybrid orbitals in the following compounds $CH_3 - CH = CH - CH_3$

1) 8

2) 6

3) 14

4) 12

5) The number of σ and π bonds in acetone molecule are respectively

1) 1, 9

2) 1, 8

3) 9, 1

4) 10, 1

6) The C – C bond length in graphite is

1) 1.54 A^0

2) 1.34 A^0

3) 1.42 A^0

4) 1.25 A^0

7) The total number of bonds in tetra cyano methane

1) 8

2) 16

3) 9

4) 18

8) The molecule which used 12 hybridised orbitals for bonding is

1) Propane

2) 1, 3 – butadiene

3) 1, 3, 5 - hexatriyne

4) All

9) **The compound 1, 2 – butadiene has…. Hybridised Carbon atoms**

1) sp

2) sp^2

3) sp, sp^2, sp^3

4) sp, sp^2, sp^3

10) **The ratio of the number of sp, sp^2 and sp^3 carbons in the compound given below is $H_2C = C = CH - CH_3$**

1) 1 : 2 : 1

2) 2 : 1 : 1

3) 1 : 1 : 1

4) 1 : 2 : 3

11) The ratio of the number of sp, sp^2 and sp^3 orbitals in the structural compound given below is

$$CH_3 - CH = C = CH - C \equiv C - CH_3$$

1) 1 : 1 : 1

2) 2 : 2 : 1

3) 3 : 2 : 1

4) 3 : 3 : 4

12) A hydrocarbon contains 7 carbons. The hybridization of them respectively are sp^3, sp^2, sp^2, sp^3, sp, sp^3 identify the hydro carbon

1) $CH_3 - CH = CH - CH_2 - C \equiv CH$

2) $CH_3 - CH = CH - CH_2 - C \equiv C - CH_3$

3) $CH_3 - C \equiv C - CH_2 - CH_2 - CH_2 - CH_2$

4) $CH_3 - CH_2 - CH = CH - CH_2 - C \equiv CH$

OBJECTIVE QUESTIONS
PCQS

PCQS

1) The formal charges of C and O atoms in $CO_2\left(:\ddot{O}=C=\ddot{O}:\right)$ are, respectively (EAMCET-2012)

1) 1, -1

2) -1, 1

3) 2, -2

4) 0, 0

2) Match the following lists (2004 E)

List - I	List - II
A) Ethane	1) 2sp carbons
B) Ethylene	2) 6sp^2 carbons
C) Acetylene	3) 2sp^3 carbons
D) Benzene	4) 2sp^2 carbons
	5) 1sp and 1sp^2 carbons

The correct answer is

1) A – 3, B – 4, C – 1, D – 2

2) A – 4, B – 5, C – 3, D – 2

3) A – 1, B – 2, C – 3, D – 4

4) A – 4, B – 3, C – 5, D – 1

3) How many “methyl groups” are present in 2, 5 – dimethyl – 4 – ethyl heptane? (2003 M)

1) 2

2) 3

3) 4

4) 5

4) The homologue of ethyne is (2000 E)

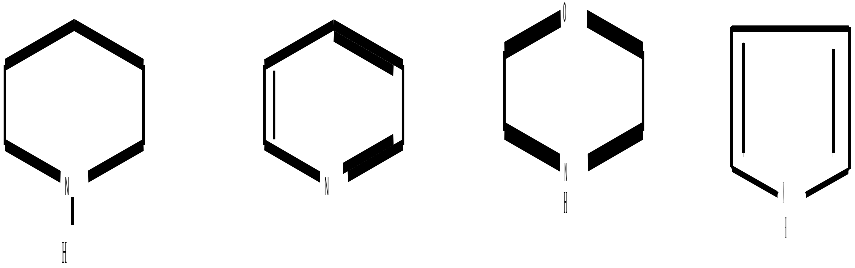
1) C_2H_4

2) C_2H_6

3) C_3H_8

4) C_3H_4

5) The order of basicity of the compounds



(I) (II) (III) (IV)

1) I > III > II > IV

2) III > I > IV > II

3) IV > I > III > II

4) II > I > III > IV

OBJECTIVE QUESTIONS
LEVEL-I

LEVEL - I

1) The suffixes for alcohols, aldehydes and ketones, according to IUPAC system are respectively

1) –ane, -al -ketone

2) –ol – al - ketone

3) –ol, -al, -one

4) –ol, -ane, -one

2) The IUPAC name of alcohol is______and that of aldehyde is_______

a) Alkanol, Alkanal

b) Alkanal, Alkanol

c) Alkanone, Alkanal

d) Alkanal, Alkanone

3) In I.U.P.A.C system naming of organic compounds which of the following functional group has more preference than others (in a poly functional compound)

1) –OH

2) –CHO

3) –CO–

4) $–CONH_2$

4) If a carbon compound has more functional groups, then order of preference while naming it according to IUPAC nomenclature

1) $–CHO>-COOH-OH_2>-NH_2$

2) $–COOH>-CHO>-NH_2>-OH$

3) $–COOH>-OH>- NH_2>-CHO$

4) $–COOH>-CHO>-OH>-NH_2$

5) An organic compound contains –OH, $-C\equiv C-$, –CHO, $-\overset{\displaystyle O}{\overset{\|}{C}}-$ groups. According to IUPAC nomenclature, principal functional group is…

1) $-C\equiv C-$

2) –OH

3) $-\underset{|}{C}=O$

4) $-\overset{\displaystyle H}{\overset{|}{C}}=O$

6) Which of the following statements is incorrect?

1) –CH_2-contains secondary carbon atom

2) IUPAC names depend on structure

3) Root word indicates number of carbon atom in parent chain

4) Sum of numbers indicating position of substituents must be maximum in IUPAC system.

7) The correct IUPAC name of

$$\begin{array}{c} CH_3 \\ | \\ H_3C - C - CH_3 \\ | \\ CH_3 \end{array}$$

1) Neopentane

2) 2, 2-Dimethyl propane

3) Methyl Butane

4) Tertiary pentane

8) IUPAC name of $CH_2 = CH$ – group is

1) Vinyl

2) Ethyl

3) Ethenyl

4) Ethynyl

9) IUPAC names of $CH_2 = CH – CH_2$ – group is

1) 1-propenyl

2) 2-propenyl

3) Allyl

4) Vinyl

10) IUPAC names of $CH_3 – CH = CH –$ group is

1) 1-propenyl

2) 2-propenyl

3) Vinyl

4) Allyl

11) Isobutyl group is

a) $CH_3 - CH_2 - CH_2 - CH_2-$

b) $$\begin{array}{l} CH_3 - CH_2 - \underset{|}{C}H - CH_3 \end{array}$$

c) $$\begin{array}{cccc} -CH_2 - & CH & - & CH_3 \\ & | & & \\ & CH_3 & & \end{array}$$

d) $$\begin{array}{ccc} & CH_3 & \\ & | & \\ - & C & - CH_3 \\ & | & \\ & CH_3 & \end{array}$$

12) **Secondary butyl group is …**

a) $CH_3 - CH_2 - CH_2 - CH_2-$

c) $$\begin{array}{l} - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_3 \end{array}$$

b) $$CH_3 - CH_2 - \underset{|}{CH} - CH_3$$

d) $$- \begin{array}{c} CH_3 \\ | \\ C \\ | \\ CH_3 \end{array} - CH_3$$

13) False statement regarding Isopentane is

1) It has 3 CH_3 groups

2) It has one CH_2 group

3) It has one CH group

4) It has carbon atom which is not bonded to hydrogen

14) The number of quaternary carbons and quaternary hydrogens in neopentane respectively are…

1) 1, 1

2) 1, 0

3) 1, 2

4) 0, 0

15) The number & type of carbon atoms present in neopentane are

1) Four 1^0 carbons, one 4^0 carbon

2) Two 1^0 carbons, two 4^0 carbon

3) One 1^0 carbons, one 4^0 carbon

4) One 1^0 carbons, one 4^0 carbon

16) Total number of tertiary hydrogen atoms in $CH_3-\underset{\underset{\displaystyle CH_3}{|}}{CH}-CH_2-CH_3$ **is**

1) 1

2) 2

3) 43

4) 4

17) **Which of the following compounds does not have any tertiary hydrogen atoms**

1) $(CH_3)_3CCH_2CH_3$

2) $(CH_3)_2CHCH_2CH_3$

3) $(CH_3)_2CHCH(CH_3)_2$

4) $(CH_3)_3CH$

18) The number of linear carbon atoms in acetylene molecule are

1) 3

2) 2

3) 4

4) 5

19) The compound which has one isopropyl group is

1) 2, 2, 3, 3 – tetra methyl pentane

2) 2, 2 – dimethyl pentane

3) 2, 2, 3 – trimethyl pentane

4) 2 – methyl pentane

20) IUPAC name of $CH_2 = C = CH_2$ is…

1) Propa 1, 2-diene

2) 1, 1-propadiene

3) 2, 2-propadiene

4) 1, 3-propadiene

21) $CH_3 - CH = CH - C \equiv CH$ The correct IUPAC name is

1) Pent – 3 – en – 1 – yne

2) Pent – 2 – ene, 4 – yne

3) 2 – pentene, 4 - pentyne

4) 1 – pentyne, 3 – pentene

22) The IUPAC name of $CHCl_3$ is…

1) Chloroform

2) Carbon trichloride

3) Trichloro methane

4) None of these

23) IUPAC name of CH_3CHCl_2

1) Ethenedichloride

2) Dichloro ethane

3) 1, 1 – Dichloro ethane

4) Ethylidene chloride

24) IUPAC name of $CH_3 - O - CH_2 - CH_3$ is …

1) Methoxy methane

2) Methoxy ethane

3) Ethoxy methane

4) Ethoxyethane

25) $CH_3 - CHO$ is called

1) Methanal

2) Acetaldehyde

3) Both 1 and 2

4) Ethanol

26) Acetone is the first member of

1) Alkanone family

2) Alkanol family

3) Alkanal family

4) Acid family

27) IUPAC name of HCOOH

1) Formic acid

2) Methanoic acid

3) Ethanoic acid

4) Alkanoic acid

28) The compound $CH_3\text{-}CH_2\text{-}\underset{\underset{\displaystyle O}{\|}}{C}\text{-}OH$

1) Contain one hydroxy and ketonic group

2) Is called ethanoic acid

3) Is called propionic acid

4) Has ester group

29) The IUPAC name of CH_3CN is

1) Acetonitrile

2) Methyl cyanide

3) Ethane nitrile

4) All of these

30) Methyl amine is

1) Primary amine

2) Secondary amine

3) Tertiary amine

4) Quaternary amine

31) IUPAC name of $(CH_3)_2NH$ is…

1) Dimethyl amine

2) Dimethanamine

3) N-methyl methanamine

4) Diethylamine

32) $CH_3CH_2COOCH_2CH_3$ is called…

1) Ethyl ethanoate

2) Propyl ethanoate

3) Ethylpropanoate

4) All

33) The correct IUPAC name is

1) 3 – ethyl – 2 – methyl pentane

2) 2 – methyl – 3 – ethyl pentane

3) 2 – ethyl – 3 – methyl pentane

4) 3 – methyl – 2 – ethyl pentane

34) The structure of 3 – bromoprop – 1 – ene is

1) $CH_3-\overset{\overset{\displaystyle Br}{|}}{C}=CH_2$

2) $CH_3-CH=CH-Br$

3) $CH_3-\underset{\underset{\displaystyle Br}{|}}{C}=CH-Br$

4) $Br-CH_2-CH=CH_2$

35) Neo – heptyl alcohol is correctly represented as

1)
$$\begin{array}{ccccccccc} & & CH_3 & & & & & & \\ & & | & & & & & & \\ CH_3 & - & C & - & CH & - & CH_2 & - & CH_3 \\ & & | & & | & & & & \\ & & CH_3 & & OH & & & & \end{array}$$

2)
$$\begin{array}{ccccccccccc} & & CH_3 & & & & & & & & \\ & & | & & & & & & & & \\ CH_3 & - & C & - & CH_2 & - & CH_2 & - & CH_2 & - & CH_3 \\ & & | & & & & & & & & \\ & & OH & & & & & & & & \end{array}$$

3)
$$\begin{array}{ccccccccccc} & & CH_3 & & & & & & & & \\ & & | & & & & & & & & \\ CH_3 & - & C & - & CH_2 & - & CH_2 & - & CH_2 & - & OH \\ & & | & & & & & & & & \\ & & CH_3 & & & & & & & & \end{array}$$

4)
$$\begin{array}{ccccc} & & C_2H_5 & & \\ & & | & & \\ C_2H_5 & - & C & - & OH \\ & & | & & \\ & & C_2H_5 & & \end{array}$$

36) **The structure of allylene is….**

1) $CH_3 - CH = CH_2$

2) $CH_3 - CH = CH - CH_3$

3) $CH_3 - CH_2 - CH = CH_2$

4) $CH_3 - C \equiv CH$

37) The structure of 6 – hydroxy heptanal is

1) CH_3-CH_2-CH(OH)-CH_2-CH_2-CH_2-CHO

2) CH_3-CH_2-CH_2-CH(OH)-CH_2-CHO

3) CH_3-CH(OH)-CH_2-CH_2-CH_2-CHO

4) CH_3-CH(OH)-CH_2-CH_2-CH_2-CH_2-CHO

38) The correct structure of 7-hydroxy heptan-2-one is…

1) $HO - CH_2 - (CH_2)_4 - CH_2 - COCH_3$

2) $HO - CH_2 - (CH_2)_3 - CH_2 - COCH_3$

3) $HO - CH_2 - (CH_2)_3 - CH_2 - COOH$

4) $CH_3 - CH(OH) - (CH_2)_3 - CH_2 - COCH_3$

OBJECTIVE QUESTIONS
LEVEL-II

LEVEL - II

1)

List-I (Compounds)	List-II (Molecular formula)
A. Alcohols	1) $C_nH_{2n}O$
B. Aldehydes	2) $C_nH_{2n}O_2$
C. Carboxylic acids	3) $C_nH_{2n+2}O$
D. Alkynes	4) C_nH_{2n}
	5) C_nH_{2n-2}

1) A-3, B-1, C-2, D-5

2) A-2, B-4, C-3, D-5

3) A-1, B-2, C-3, D-5

4) A-5, B-2, C-3, D-1

2) Match the following

List - I	List - II
A) $-OH$	1) Oic acid
B) $-COOH$	2) al
C) $-CHO$	3) One
D) $-CO-$	4) ol
E) $-NH_2$	

1) A-1, B-2, C-3, D-4

2) A-4, B-1, C-2, D-3

3) A-2, B-3, D-1, E-4

4) A-3, C-1, D-2, E-4

3) The correct priority order of principal functional group

a) acid

b) aldehydes

c) nitriles

d) alcohols

1) a > b > c > d

2) a > c > d > b

3) a > c > b > d

4) a > d > b > a

4) Match the following

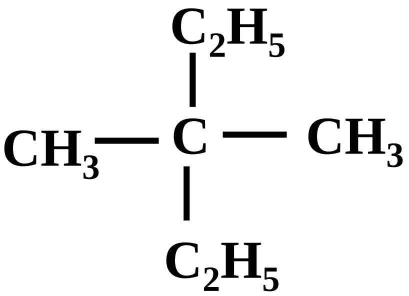
List – I (Substituent)	List – II (Prefix)
A – OH	1) Cyano
B – CHO	2) Hydroxy
C – CO –	3) Carboxylic
D – CN	4) formly
	5) Oxo (or) keto

1) A-2, B-4, C-1, D-5

2) A-2, B-4, C-5, D-1

3) A-2, B-4, C-5, D-1

4) A-2, B-4, C-1, D-3

5)  IUPAC name is

1) 2, 2-Diethyl propane

2) 3, 3-Dimethyl pentane

3) 3-ethyl-3-methyl butane

4) 3-ethyl-2-methyl butane

6) IUPAC name of $(CH_3)_2CH\text{-}CH(CH_3)_2$ is

1) 1, 1, 2, 3 – Tetra ethyl ethane

2) 1, 2, – Di isopropyl ethane

3) 2, 3 – Dimethyl butane

4) 2, 3, 3 – Trimethyl butane

7) Which of the following represents 2, 2, 3 – Trimethylhexane?

1) $CH_3\text{-}C(CH_3)_2\text{-}CH_2\text{-}CH_2\text{-}CH(CH_3)_2$

2) $CH_3\text{-}CH(CH_3)\text{-}CH_2\text{-}CH(CH_3)\text{-}CH_2\text{-}CH_3$

3) $CH_3\text{-}C(CH_3)_2\text{-}CH(CH_3)\text{-}CH_2\text{-}CH_2\text{-}CH_3$

4) $CH_3\text{-}C(CH_3)_2\text{-}CH_2\text{-}C(CH_3)_2\text{-}CH_3$

8) Correct IUPAC name of $CH_3\text{-}CH_2\text{-}CH_2\text{-}CH\ \text{–}CH_2\text{-}CH_2\text{-}CH_3$

$$
\begin{array}{c}
CH_3\text{-}CH_2\text{-}CH_2\text{-}\underset{\displaystyle\underset{\displaystyle H_3C\text{-}\overset{|}{C}H\text{-}CH_3}{\overset{|}{CH}}}{CH}\text{–}CH_2\text{-}CH_2\text{-}CH_3
\end{array}
$$

1) 4 – (2- Methyl propyl) heptane

2) 4 – isobutyl heptane

3) 2 – Methyl -4 – propyl heptane

4) 2- Methyl decane

9) $\begin{array}{l} CH_3\text{-}\underset{\displaystyle C_2H_5}{\underset{|}{CH}}\text{-}CH_2\text{-}\underset{\displaystyle C_2H_5}{\underset{|}{CH}}\text{-}CH_3 \end{array}$ IUPAC name is

1) 2, 4 – diethyl pentane

2) 3, 5 – dimethyl heptane

3) 3 – methyl 5 – ethyl hexane

4) 5 – ethyl – 3 – methyl hexane

10) The IUPAC name of $CH_3-CH-CH-CH_3$ is

$$\begin{array}{cccc} CH_3- & CH- & CH & -CH_3 \\ & | & | & \\ & C_2H_5 & CH_3 & \end{array}$$

1) 2-ethyl- 3- methyl butane

2) 2, 3 – dimethyl pentane

3) 2- methyl-3-ethylbutane

4) All the above

11) IUPAC name of

$$\begin{array}{ccccc} & & CH_3 & & \\ & & | & & \\ CH_3\text{-}(CH_2)_4\text{-}CH & - & C & - & CH_2\text{-}CH_3 \\ | & & | & & \\ CH_3 & & (CH_2)_2CH_3 & & \end{array}$$

1) 3-Ethyl-3, 4-dimethylhexane

2) 4-Ethyl-4, 5-dimethyldecane

3) 3-propyl-3, 4-dimethylnonane

4) All the above

12) IUPAC name of $$\begin{array}{l} CH_3\text{-}CH_2\text{-}CH_2\text{-}\underset{|}{C}H\text{-}CH_3 \\ \qquad\qquad\quad CH_3\text{-}CH\text{-}CH_3 \end{array}$$

1) 2, 3 – dimethyl hexane

2) 2-methyl – 3 – propyl butane

3) 2-isopropyl pentane

4) None of these

13) IUPAC name of

$$\begin{array}{ccccc} & & & CH_3 & \\ & & & | & \\ CH_3\text{-}(CH_2)_4\text{-} & CH & - & C & - CH_2\text{-}CH_2\text{-}CH_3 \\ & | & & | & \\ & CH_3 & & CH_2\text{-}CH_3 & \end{array}$$

1) 3, 4-dimethyl-3-propylnonane

2) 4-ethyl-4, 5 – dimethyl decane

3) 6, 7 – dimethyl – 7 ethyl nonane

4) 6, 7 – dimethyl 1 – 7 – ethyl decane

14) The structural formula of 3 – ethyl – 2 – methyl hexane is…

1) $CH_3 - CH(CH_3)\text{-}CH(C_2H_5)\text{-}CH_2CH_2\text{-}CH_3$

2) $CH_3\text{-}CH_2CH(C_2H_5)\text{-}CH(CH_3)\text{-}CH_2\text{-}CH_3$

3) Either (1) or (2)

4) None of these

15) **The systematic name of the organic compound having the structure** $CH_3\text{-}CH_2\text{-}CH_2\text{-}\underset{\displaystyle CH(CH_3)_2}{\underset{|}{CH}}\text{-}CH_2\text{-}CH_2\text{-}CH_3$ **is**

1) **4-Isopropyl hexane**

2) **2-Methyl – 3 - propylhexane**

3) **Isodecane**

4) **4-(1-Methylethyl)heptane**

16) IUPAC name of $CH_2=CH-CH(CH_3)_2$ is

1) 1, 1 – Dimethyl – 2 - propane

2) 3 – Methyl – 1- butene

3) 2-vinyl propane

4) 1-Isopropyl ethylene

17) IUPAC name of $CH_3-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{CH_2}{\|}}{C}-CH_2-CH_3$ is ….

1) 2-ethyl-3-methyl but-1-ene

2) 2-Ispropyl but-1-ene

3) 2-Methyl-3-ethyl-3-butene

4) 2-(1-Methyl ethyl) but -1-ene

18) IUPAC name of $$\begin{array}{c} \quad\quad CH_3 \\ \quad\quad | \\ CH_3\text{-}C\text{-}CH{=}CH_2 \\ \quad\quad | \\ \quad\quad CH_3 \end{array}$$ is

1) 3, 3, 3 – Trimethyl – 1- propene

2) 1, 1, 1 – Trimethyl – 3 - Propene

3) 3, 3 – Dimethyl – 1- butene

4) 1, 1 – Dimethyl – 3- butene

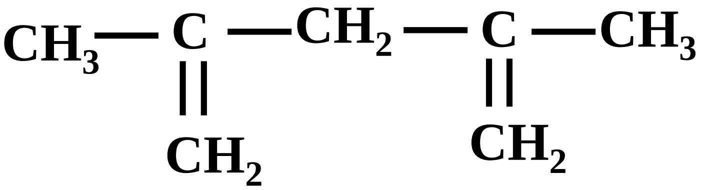
19) $CH_3-CH_2-\underset{\large CH_3}{\overset{\large CH_3}{\overset{|}{\underset{|}{C}}}}-\underset{\large C_2H_5}{\underset{|}{C}}=CH-CH_3$ **The IUPAC name is**

1) 3-ethyl 4, 4-dimethyl – 2- hexene

2) 4-ethyl-3, 3-dimethyl-2-hexene

3) 4-ethyl-3, 3-dimethyl – 4 -hexene

4) All of those

20)  IUPAC name is

1) 2, 4-pentadiene

2) 2, 4-dimethyl-1,4-pentadiene

3) 2, 4 - butadiene

4) 2, 3 - butadiene

21) The IUPAC name of $H_3C\text{-}C{\equiv}C\text{-}CH(CH_3)_2$ is

1) 4-Methyl-2-pentyne

2) 4, 4, - Dimethyl – 2 – butyne

3) Isopropylmethyl acetylene

4) 2-Methyl-4-pentyne

22) IUPAC name of $CH \equiv C - CH = CH_2$ is

1) But – 3 –en – 1 -yne

2) But – 1 – en -3 - yne

3) But – 1 – yn – 3 - ene

4) But – 3 –yn – 1 -ene

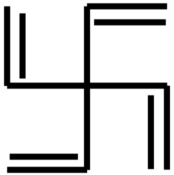
23) IUPAC name of compound $CH_3-\underset{\displaystyle OH}{\underset{|}{C}}H-(CH_2)_2-C\equiv CH$ is

1) 2-Hydroxy 5 - hexyne

2) 1-yne-2-hexanol

3) Hex-5-yne-2-ol

4) Hex-5-yn-2-ol

24) IUPAC name of the compound  is

1) Nomatetraene

2) Diene pentadiene

3) 3, 3-Diethenyl-1,4-Pentadiene

4) None of these

25) IUPAC name of the tertiary butyl alcohol is

1) butanol-1

2) 2-methyl propanol - 1

3) 2-methyl propanol-2

4) butanol-2

26) IUPAC name of CH_2OH-CH_2OH is

1) 1, 2-dihydroxy ethane

2) Ethylene glyco

3) Ethane – 1, 2-diol

4) Ethane -1,2 -dial

27) The IUPAC name of $(C_2H_5)_2CHCHCH_2OH$ is

1) 3-methyl butanol-1

2) 2-methyl pentanol-1

3) 3-ethyl pentanol-1

4) 2-ethyl butanol -1

28) IUPAC name of the compound $C_2H_5 - \underset{\underset{CH_2}{\|}}{C} - CH_2OH$

1) 2- Ethyl prop-2-en-l-ol

2) 2- Hydroxymethyl butan– l- ol

3) 2- Methylene butan – l- ol

4) 2- Ethyl – 3 –hydroxyprop-1-ene

29) IUPAC name of CH_3-CH=CH-CH_2OH

1) 1-ene-1-butanol

2) But -2-en-1-ol

3) 2-Buten – 2- ol

4) All the above

30) The IUPAC name of $CH_3-\overset{\displaystyle OH}{\overset{|}{C}}H-CH_2-\overset{\displaystyle CH_3}{\overset{|}{C}}H-CHO$ is

1) 4-hydroxy-2-methyl pentanal

2) 2-hydroxy-4-methyl pentanal

3) 4-hydroxy-2-methyl pentanol

4) 2-hydroxy-4-methyl pentanol

31)The IUPAC name of the compound CH_3-$CH(C_2H_5)$-CH_2-$CH(OH)$-CH_3

1) 4-Ethyl pentanol-2

2) 4-Methyl hexanol-2

3) 2-Ethyl pentanol-2

4) 3-Methylhexanol-2

32) IUPAC name of $(C_2H_5)_2CH\text{-}CH_2OH$ is

1) 2-Ethyl butanol - 1

2) 2-Methyl pentanol - 1

3) 2 – Ethyl pentanol - 1

4) 3 – Ethyl butanol - 1

33) The correct IUPAC name of the compound CH_2=CH-CH_2Cl

1) Allyl chloride

2) 1-chloro-3-propene

3) 1-chloro-2-propene

4) 3-chloro-1-propene

34) IUPAC name of $(CH_3)_2CH\text{-}CH_2Br$

1) 1-Bromo-2-methyl propane

2) 2-methyl-3-Bromo propane

3) Iso propyl Bromide

4) 3^0 butyl bromide

35) IUPAC name of CCl_4 is….

1) Pyrene

2) Carbon tetrachloride

3) Tetrachlorocarbon

4) Tetrachloromethane

36) **Structure of hexa fluoro ethane is**

1) $FCH_2-CH_2-CH_2-CH_2-CH_2-CH_3$

2) F_3C-CF_3

3) $CH_3-CH_2-CH_2-CHF-CF_2-CF_3$

4) CH_3-CF_3

37) The IUPAC name of t-butyl alcohol is

1) 2-methyl propan – 2 - ol

2) 2,2-dimethyl propane – 2 - ol

3) 2-methyl butane – 2-ol

4) None of these

38) IUPAC name of

$$\begin{array}{c}
\quad\;\; OH \\
\quad\;\; | \\
CH_3\text{-}C\text{-}CH_2\text{-}CH_2\text{-}CH_3 \\
\quad\;\; | \\
\qquad\qquad CH_2\text{-}CH_3
\end{array}$$

1) 3-methyl-3hexanol

2) 2-ethyl-2-pentanol

3) 2-ethyl-2 hydroxy pentane

4) Any of these

39) Give the IUPAC name of

$$\begin{array}{ccccc} OH & & OH & & OH \\ | & & | & & | \\ CH_2 & - & CH & - & CH_2 \end{array}$$

1) Glycerol

2) Propane triol

3) Propane – 1,2,3-triol

4) 1, 2, 3, - tripropanol

40) The IUPAC Name of isobutanol is

1) 2-methyl propanol

2) 2-methyl-2-propanol

3) 2-butanol

4) 2-methyl-1-propanol

41) $CH_3-\underset{\substack{|\\ OH}}{CH}-CH_2-CH_2OH$ has the IUPAC name

1)3-hydroxy butanol

2) butane-1,3-diol

3) Butane glycol

4) 1,3- dihydroxy butane

42) IUPAC name of $CH_3\text{-}O\text{-}\underset{\displaystyle CH_3}{\underset{|}{CH}}\text{-}CH_3$ is...

1) methyl propyl ether

2) methyl isopropyl ether

3) 2-methoxy propane

4) All the above

43) IUPAC name of CH_3-O-$CH_2CH_2CH_2CH_3$ is

1) 1-butoxy methane

2) Mehtyl carbyl ether

3) Pentanone

4) 1-methoxybutane

44) The IUPAC name of $CH_3CH_2CH_2\underset{\underset{\displaystyle O}{\|}}{C}-CH_3$

1) 2-pentanone

2) Pentanone-2

3) Pentan-2-one

4) All are correct

45) The IUPAC name of $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-\underset{\displaystyle O}{\underset{\|}{C}}-CH2-CH2-OH$ is

1) 1-Hydroxy-4-methyl-3-pentanone

2) 2-Methyl-5-hydroxy-3-pentanone

3) 4-Methyl-3-oxo-1-pentanol

4) Hexanol-1-one-3

46) IUPAC name of $Cl_3C\text{-}CH_2CHO$ is

1) 3, 3, 3-Trichloropropanal

2) 1, 1, 1-Trichloropropanal

3) 2, 2, 2-Trichloropropanal

4) Chloral

47) The IUPAC name of $CH_3-\underset{\underset{\displaystyle CH_3}{|}}{C}=CH-COOH$ is

1) 2-Methyl-2-butenoic acid

2) 3-Methyl-3-butenoic acid

3) 3-Methyl-2-butenoic acid

4) 2-Methyl-3-butenoic acid

48) IUPAC name of HOOC– CH_2-CHO is

1) 2- Formyl ethanoic acid

2) 2- Carboxyethanal

3) Prop-3-al-l-oic acid

4) Prop-l-al-3-oic acid

49) The IUPAC name of $CH_3-\underset{\underset{\displaystyle Cl}{|}}{C}H-COOH$ **is**

1) 2-Chloro propinoic acid

2) Chloro propanoic acid

3) 2-chloro propanoic acid

4) Propanoic acid chloride

50) IUPAC name of CH_3-CHCl-CH_2-CHO is

1) 2-chloro – 4- butanol

2) 3-chloro butanol

3) 2-chloro-4- butanal

4) 3-chloro butanal

51) The correct IUPAC name of $\mathrm{H-\underset{\underset{O}{\|}}{C}-CHO}$ is

1) Formyl methanal

2) 1, 2-Ethanedione

3) 2-Oxoethanal

4) Ethanedial

52) Structure of prop-2-ynal

1) CH_3-C≡C-OH

2) CH≡C-CH_2-OH

3) CH≡C-CHO

4) CH_2=CH-CHO

53) IUPAC name of $(CH_3)_3C\text{-}CH{=}CH\text{-}CHO$

1) 4, 4, 4-trimethyl but – 2 – en – 1- al

2) 4, 4-dimethyl pent-2-enal

3) 2, 2-dimethyl pent – 3 – en – 4 - al

4) 3-tert, butyl prop-2-en-1-al

54) CH_3COCH_2CN has the IUPAC name

1) 3-oxo butane nitrile

2) 1-cyano propane

3) 2-oxo propane

4) 1-cynaobutanone-2

55) **The IUPAC name of the formula** $CH_3-\underset{\underset{\displaystyle CH_3}{|}}{C}=CH-COOH$

1) **2-Mrthyl-2-butenoic acid**

2) **3-Methyl-3-butenoic acid**

3) **3-Methyl-2-butenoic acid**

4) **2-Methyl-3-butenoic acid**

56) The IUPAC name of $(CH_3)_2CH\text{-}COOH$

1) 2-Propanoic acid

2) Isobutanoic acid

3) 2-Methylpropanoic acid

4) 2-Methlbutanoic acid

57) The IUPAC name of $\begin{array}{c} HO\text{-}CH_2\text{-}\underset{\displaystyle NH_2}{\underset{|}{CH}}\text{-}COOH \end{array}$

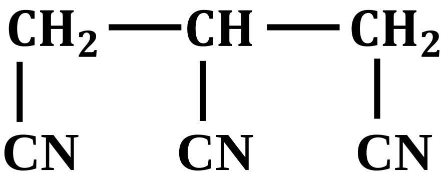
1) 3-hydroxy-2-aminobutanoic acid

2) 2-amino-3-carboxypropanol

3) 2-amino-3-hydroxy-propanoic acid

4) 2-amino-3-hydroxybutanoic acid

OBJECTIVE QUESTIONS
LEVEL-III

1) 

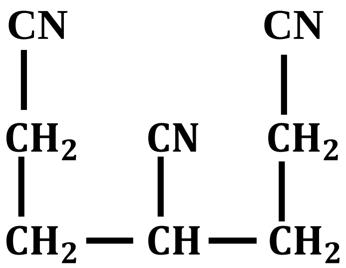
1) 2-Ethyl-4-methylhexane

2) 2-Amino-4-methylpentane

3) 3-Ethylhexane

4) Propane-1, 2, 3-tricarbonitrile

2) The IUPAC name of the structure given below is



1) 1, 3, 5, - cyanopentane

2) Pentane tricyanide

3) Pentane- 1, 3, 5 – tricarbo nitrile

4) 4 – cyano heptanedicyanide

3) $CH_3 - CH_2 - CO - \underset{\displaystyle CN}{\underset{|}{CH}} - COOH$

The IUPAC name of the compound is

1) 3 – Ketonic – 2 –cyano pentanoic acid

2) cyanoketohexanoic acid

3) 3 – oxo – 2 – cyano pentanoic acid

4) 2 – cyano – 3 – oxo pentanoic acid

4) IUPAC name of succinic acid is

1) Butane – 1, 4 – dioic acid

2) Oxalic acid

3) Propanedioic acid

4) Ethanedioicacid

5) $\mathbf{HOOC - (CH_2)_4 - COOH}$ **is called**

1) Hexanedioic acid

2) Glutaric acid

3) Both 1 and 2

4) Succinic acid

6) $CH_2 = CH - CH = CH_2$ is called

1) Butadiene

2) 1, 2 - Butadiene

3) 1, 4 - Butadiene

4) 1, 3 - Butadiene

7) $\mathbf{CH \equiv C - CH_2 - CH_2 - CH = CH_2}$

IUPAC name of the compound is

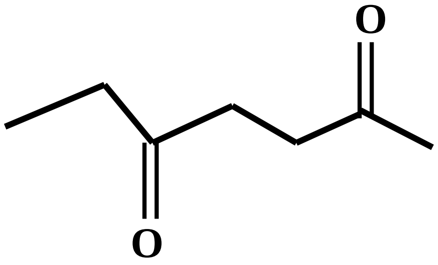
1) 1 – yne – 5 - hexene

2) Hex – 1 – ene – 5 -yne

3) Hex – 5 – yne – 1 - ene

4) Hex – 1 – en – 5 - yne

8) IUPAC name of compound



is

1) Hepta -2, 5 - diketone

2) 2, 5 - diketoheptane

3) Hepta – 2, 5 - dione

4) Heptane 2, 5 - dione

9) IUPAC name of following

$$\begin{array}{l} HOOC - CH_2 - CH_2 - \underset{\displaystyle COOEt}{\underset{|}{CH}} - COOH \end{array}$$

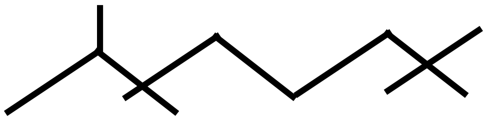
1) 2 – Carbalkoxypentanedioic acid

2) 2 – Carbethoxypentane – 1, 5 – dioic acid

3) 2 – Ethylesterpentanedioic acid

4) 2 – Ethylpentanedioic acid

10) IUPAC name of the alkane is



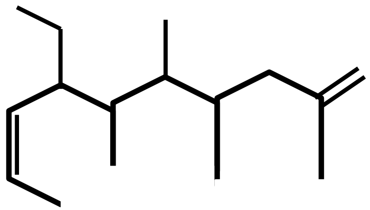
1) 2 – Isopropyl – 2, 6, 6 - trimethylheptane

2) 5 – tert-butyl-2isopropyl-2-methylpentane

3) 2, 3, 3, 7, 7 - Pentamethyloctae

4) 2, 2, 6, 6, 7 - Pentamethyloctane

11) The IUPAC name of



1) 7 – Ethyl – 2, 4, 5, 6- tetramethyldeca -1, 8- diene

2) 7 – ethyl – 2 – methyl 4, 5, 6-tetramethyldeca 1, 7-diene

3) 7 – (I – Propeny) 2, 3, 4, 5- tetramethyl - nonene

4) 4 – Ethyl- 5, 6, 7, 9-tetramethyldeaca- 2, 9-diene

12) IUPAC name of $CH_3 - CH(OCH_3) - CH_2 - NH_2$

1) 2 – methoxy 1 - propanamine

2) 1 – amino – 2- methoxy propane

3) 1 – amino – 2 –methyl – 2 – methoxy ethane

4) 1 – methoxy – 2 – amino propane

13) IUPAC name of

$$\begin{array}{c} HOOC - CH_2 - \underset{\displaystyle \begin{array}{c} | \\ COOH \end{array}}{CH} - CH_2 - COOH \end{array}$$

1) 3 – Carboxy pentane – 1, 5 – dioic acid

2) Propane – 1, 2, 3 – trioic acid

3) 1, 2, 3 – tricarboxylic propane

4) Propane – 1, 2, 3 – tri carboxylic acid

14) $$\begin{array}{l} CH_3 - CH_2 - CH_2 - CH_2 - \underset{\displaystyle |}{CH} - CH_2 - CH_2 - CH_2 - CH_2 \\ \qquad\qquad\qquad\qquad\qquad\quad \underset{\displaystyle |}{CH} - CH_3 \\ \qquad\qquad\qquad\qquad\qquad\quad \underset{\displaystyle |}{CH} - CH_3 \\ \qquad\qquad\qquad\qquad\qquad\quad CH_3 \end{array}$$

1) 2-Ethyl -4 -methylhexane

2) 2 - Ethylhexane

3) 3 - Ethylhexane

4) 5 – (1, 2 – dimethyl propyl) nonane

$$\begin{array}{l} \qquad\qquad\quad Cl \qquad\qquad\qquad\quad CH_3 \quad F \\ \qquad\qquad\quad\; | \qquad\qquad\qquad\qquad\; | \qquad\;\; | \\ 15)\; CH_3 - C - CH_2 - CH - CH - CH_2 - CH_3 \\ \qquad\qquad\quad\; | \\ \qquad\qquad\quad Br \end{array}$$

1) 2 – Ethyl – 4 - methylhexane

2) 2 - Ethylhexane

3) 3 - Ethylhexane

4) 2 – Bromo – 2 – chloro – 5 – fluro – 4 - methylheptane

16) $$\begin{array}{ccccccccccccc} & & & & & & Br & & O & & & & \\ & & & & & & | & & \| & & & & \\ CH_3 & - & CH_2 & - & CH & - & CH & - & C & - & CH_2 & - & CH_3 \\ & & & & | & & & & & & & & \\ & & & & CH_2 - CH_3 & & & & & & & & \end{array}$$

1) 2 – Ethyl – 4 - methylhexane

2) 2 – Amino – 4 - methylpentane

3) 3 - Ethylhexane

4) 4 – Bromo – 5 – ethyl – 3 - heptanone

17) $CH_3 - \overset{\overset{O}{\|}}{C} - CH_2 - CH_2 - \overset{\overset{O}{\|}}{C} - CH_3$

1) 2 – Ethyl – 4 - methylhexane

2) 2 – Amino – 4 - methylpentane

3) 3 - Ethylhexane

4) 2, 5 – Hexanedione

18) $CH_3 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - \overset{\displaystyle O}{\overset{\|}{C}} - Cl$

1) 2 – Ethyl – 4 - methylhexane

2) 2 – Amino – 4 - methylpentane

3) 3 - Ethylhexane

4) 3 – Methylpentanoyl Chloride

19) $CH_3 - \overset{Br}{\overset{|}{C}}H - CH_2 - \overset{Cl}{\overset{|}{C}}H - CH_3$

1) 2 – Bromo – 4 - Chloropentane

2) 2- Ethylhexane

3) 3 - Ethylhexane

4) 4 – Ethyl – 2- methylhexane

20) The IUPAC name of the compound

$$\begin{array}{l} CH_3 - \underset{\substack{| \\ CH(CH_3)_2}}{CH} - CH_2 - CH_2 - CH_3 \end{array}$$ is

1) 2 – Isopropyl pentane

2) 2, 3 – Dimethyl hexane

3) Isononane

4) 2, 4 – Dimethyl hexane

21) The IUPAC name of the following

$$\begin{array}{l} CH_3 - CH = \underset{\displaystyle |\atop \displaystyle CH_2 - CH_2 - CH_3}{C} - CH_2 - CH_3 \end{array}$$

compound is

1) 3 – propyl – 3 - hexene

2) 3 – propyl – 2 - hexene

3) 3 – ethyl – 2 - hexene

4) 4 – ethyl – 4- hexene

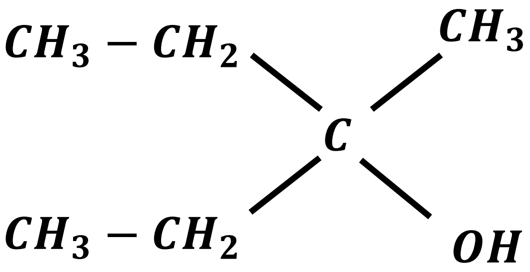
22)The IUPAC name of $CH_3 - \underset{\displaystyle Cl}{\underset{|}{C}} = \underset{\displaystyle CH_3}{\underset{|}{C}} - \overset{\displaystyle C_2H_5}{\overset{|}{CH}} - CH_2 - C \equiv CH$ is

1) 6 – chloro – 4 – ethyl – 5 – methyl hept – 5 – ene – 1 - yne

2) 6 – chloro – 4 – ethyl – 5 – methyl hept – 1 – yne – 5 - ene

3) 2 – chloro – 4 – ethyl – 3 – methyl hept – 2 – ene – 6 - yne

4) 2 – chloro – 4 – ethyl – 3 – methyl hept – 6 – yne – 2 - ene

23) The IUPAC name of  is

1) 2 – Ethyl – 2 - butanol

2) 3 – Methyl – 3 - pentanol

3) 3 – Ethyl – 3 methyl – 3 - pentanol

4) 1, 1 – Diethyl ethanol

24) The IUPAC name of $CH_3 - \underset{\Large |\atop OH}{\overset{H \atop \Large |}{C}} - CH_2 - CH_2 - CH_2 - \underset{\Large |\atop Br}{\overset{Br \atop \Large |}{C}} - CH_3$ **is**

1) 6, 6 – dibromo heptan – 2 - ol

2) 2, 2 – dibromo heptan – 6 - ol

3) 6, 6 – dibromo heptan – 2 - al

4) 2, 2 – dibromo heptan – 6 - al

25) The IUPAC name of $CH_3-\overset{\overset{\displaystyle OH}{|}}{C}H-\underset{\underset{\displaystyle OH}{|}}{C}H-\overset{\overset{\displaystyle CH_3}{|}}{C}H-CHO$ is

1) 4 – hydroxy – 1 methyl pentanal

2) 3, 4 – dihydroxy – 2 – methyl pentanal

3) 2 – hydroxy – 4 methyl pentanal

4) 2, 3 – dihydroxy – 4 – methyl pentanal

26) The IUPAC name of $CH_3 - \overset{\overset{\displaystyle O}{\|}}{C} - CH_2 - \overset{\overset{\displaystyle OH}{|}}{CH} - CHO$ is

1) 5 – oxo – 4 hydroxy – 2 - pentanone

2) 4 – hydroxy – 5 – al – 2 - pentanone

3) 2 – hydroxy 4 – oxo pentanal

4) 1 – al – 4 – oxo – 2 - pentanol

27) The IUPAC name of the compound

$$\begin{array}{ccccccccc} & & O & & & & CN & & \\ & & \| & & & & | & & \\ CH_3 & - & C & - & CH_2 & - & C & - & CH_3 \\ & & & & & & | & & \\ & & & & & & CH_3 & & \end{array}$$

is

1) 4 – Cyano – 4 – methyl – 2 – oxo - pentane

2) 2 – Cyano – 2 – methyl – 4 – oxo - pentane

3) 2, 2 – Dimethyl – 4 – oxo - pentanenitrile

4) 4 – Cyano – 4 – methyl – 2 - pentanone

28) The IUPAC name of the compound

$$CH_3 - \overset{\overset{\large OH}{|}}{C} = CH - CH_2 - COOH$$ **is**

1) Hydroxy pentenoic acid

2) 4 – Hydroxy – 3 – pentenoic acid

3) 4 – Hydroxy – 4 pentenoic acid

4) 3 – Hydroxy – 4 – methyl – 3 – ene – pentenoic acid

29) The IUPAC name of the compound

$$CH_3 - CH(C_6H_5) - CH_2 - \underset{\displaystyle |}{\overset{\displaystyle OH}{\overset{|}{C}H}} - CH_2 - CH_3 \text{ is}$$

1) 1 – Ethyl -3 – 3 phenyl – 1 - butanol

2) 2 – Phenyl – 4 - hexanol

3) 5 – Phenyl – 3 - hexanol

4) 5 – Benzyl – 3 - hexanol

30) The IUPAC name of the compound

$$\begin{array}{ccccccccccccc} & & & & CH_3 & & & & & & & & \\ & & & & | & & & & & & & & \\ CH_3 & - & CH & - & CH & - & CH & = & CH & - & CH_2 & - & CHO \\ & & | & & & & & & & & & & \\ & & CH_3 & & & & & & & & & & \end{array}$$

is

1) 5, 6 – Dimethyl hept – 3 – en – 1 - al

2) 2, 3 – Dimethyl – 4 – en – 7 - al

3) 5, 6 – Dimethyl hept – 2 – ene – 1 - al

4) 5, 6 – Isopropyl pent – 3 – ene – 1 - al

31) The IUPAC name of the compound

$$\begin{array}{ccccccc} CH_2 & - & CH & - & CH_2 & - & CH_2 \\ | & & | & & & & | \\ NH_2 & & CH_3 & & & & NH_2 \end{array}$$

is

1) 2 – Methyl – butane – 1, 4 - diamine

2) 3 – Methyl – butane – 1, 4 - diamine

3) 2 – Methyl – butane – 1, 3 - diamine

4) 2 – Methyl pentane – 1 , 5 - diamine

32) The correct IUPAC name of the compound

$$\begin{array}{l}
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad CH_3 \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad | \\
CH_3 - CH_2 - C = CH - CH_2 - CH - CH_3 \\
\qquad\qquad\qquad\;\; | \\
CH_3 - CH_2 - CH - CH_2 - CH_2 - CH_2 - CH_3
\end{array}$$

is

1) 5, 6 – Dimethyl – 8 – methyl dec – 6 - ene

2) 5, 6 – Diethyl – 2 – methyl dec – 4 - ene

3) 6 – Butyl – 5 – ethyl – 3 – methyl oct – 4 - ene

4) 5, 6 – Diethyl – 9 – methyl dec – 6 - ene

33) The correct IUPAC name of the compound is

$$\begin{array}{l} CH_3 - CH_2 - CH_2 - \underset{\displaystyle CH_2 - CH_2 - CH_3}{\underset{|}{CH}} - CH = CH_2 \end{array}$$

1) 4 – ethenyl heptane

2) 3 – n – propyl – l - hexene

3) 4 – ethenyl hexane

4) 3 – ethenyl heptane

34) The correct IUPAC name of the compound

$$\overset{\displaystyle O}{\overbrace{CH_2 - CH}} - CH_2 - Cl$$ is

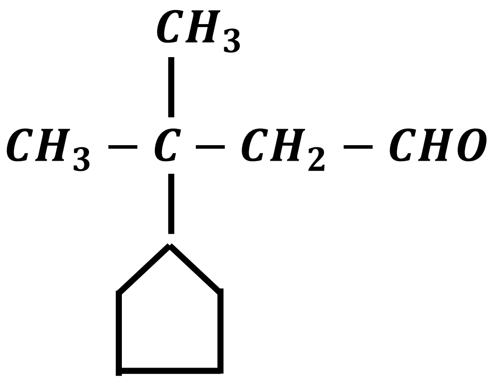
1) 2 – Epoxy – 1 – chloro propane

2) 1, 2 – Epoxy – 1 – chloro propane

3) Epoxy – 1 – chloro propane

4) 3 – Chloro – 1, 2 – epoxy propane

35) The correct IUPAC name of the compound



is

1) 3, 3 – Dimethyl – 3 – cyclopentyl peopanal

2) 3 – Methyl – 3 - cyclopentyl butanal

3) 1 – (1 – Methyl – 1 – formyl) methyl ethylcyclo propane

4) 3, 3 – Diethyl – 3 – cyclo butyl butnal

36) The IUPAC name of the compound

$$OHC - CH_2 - CH_2 - \overset{\overset{\Large O}{\|}}{C} - CH_2 - COOH$$ is

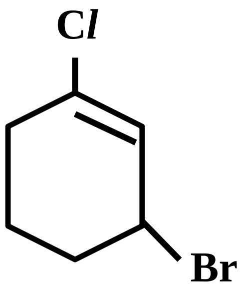
1) 1 – Formyl – 3 – oxo – pentanoic acid

2) 5 – Formyl – 3 – oxo – pentanoic acid

3) 4 – Oxo – 5 – formyl pentanoic acid

4) 3 – Oxo – 1 – formyl pentanoic acid

37) The IUPAC name of the compound



is

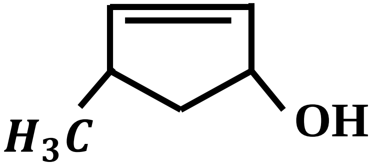
1) 1 – Bromo – 3 – chloro cyclohexene

2) 3 – Bromo – 1 – chloro cyclo hex – 1 - ene

3) 2 – Bromo – 6 – chloro cyclo hex – 1 - ene

4) 6 – Bromo – 2 chloro cyclo hex – 1 - ene

38) The IUPAC name of the compound



is

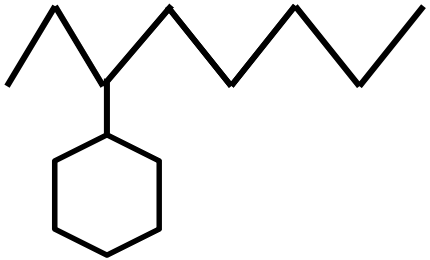
1) 4 – Methyl cyclopent – 2 en – 1 – ol

2) 2 – Hydroxy – 2 – methyl - cyclopentene

3) 3 – Hydroxy – 4 – methyl - cyclopentene

4) 5 – Methl – 3 – cyclopenten – 2 - ol

39) **The IUPAC name of the compound**



is

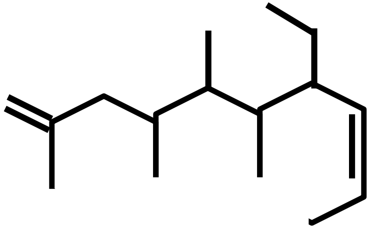
1) **Octyl benzene**

2) **Octyl cyclohexane**

3) **3 – Cyclohexyl octane**

4) **3 – Phenyl octane**

40) The correct IUPAC name of the following compound



is

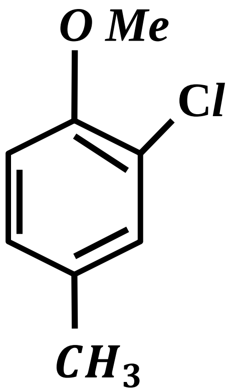
1) 7 – Ethyl – 2, 4, 5, 6 – tetra methyl deca – 1, 8 - diene

2) 4 – Ethyl – 5, 6, 7, 9 – tetra methyl deca – 2, 9 - diene

3) 2, 4, 5, 6 – Tetra methyl – 7 ethyl – deca – 1, 7 - diene

4) 5, 6, 7, 9 – Tetra methyl deca – 9 - diene

41) The IUPAC name of the compound



is

1) 2 – Chloro – 4 – methyl anisole

2) 3 – chloro – 1 – methyl anisole

3) 1 - Methyoxy – 2 – chloro - toulene

4) 1 – Methoxy – 4 – methyl – 3 – chloro benzene

42) The structure of 4 – methyl pentanal is

1) $CH_3 - CH(CH_3) - CH_2 - CH_2 - CHO$

2) $CH_3 - CH_2 - CH(CH_3)CHO$

3) $CH_3 - CH(CH_3) - CH_2 - CH_2 - OH$

4) $CH_3 - CH_2 - CH_2 - CH(CH_3) - CHO$

43) The structure of But-3-yn-1-ol is

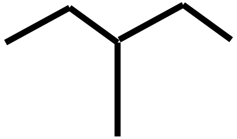
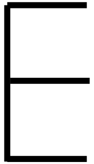
1) $H - C \equiv C - CH_2 - CH_2 - OH$

2) $CH \equiv C - \underset{}{\overset{\displaystyle OH}{\overset{|}{C}H}} - CH_3$

3) $HO - C \equiv C - CH_2 - CH_2 - CH_3$

4) $CH_3 - C \equiv C - CH_2 - OH$

44) The IUPAC name of the given compound

 or  is

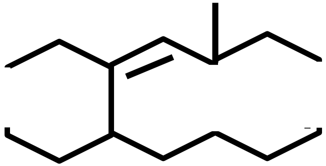
1) 3 – ethyl pentane

2) 1 – ethyl pentane

3) 2 – ethyl pentane

4) 3 – methyl pentane

45) The IUPAC name of the given compound



is

1) 5, 6 – diethyl – 3 – methyl – 4 - decene

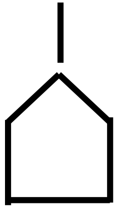
2) 7 – methyl – 2, 4, 6 – triene octanal

3) 6 – methyl heptane

4) 3, 3 – dithyl – 5 – ethyl – 4 - decene

46) The IUPAC name of

$$CH_3 - CH - CH = CH_2$$



is

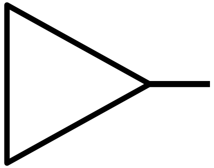
1) 3 – cyclopentyl – 1 - butene

2) 2 – cyclopentyl – 3 - butene

3) 2 – cyclopentyl – 1 - butene

4) 4 – cyclopentyl butene

47) The IUPAC name of the compound

 $CH_2 - CH - CH_2$ **is**

1) 3 – Cyclopropene – 1 - propene

2) Cyclohex – 1 - ene

3) 4 – Cyclopropyl – 1 - butane

4) 3 – Cyclopropyl – 1 - propene

48) The correct IUPAC name of

$CH_3 - CH_2 - CO - NH - CH_3$ is

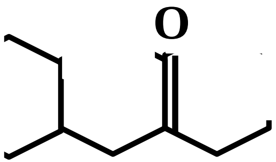
1) N – ethyl ethanamide

2) N – methyl ethanamide

3) N – methyl propanamide

4) N – ethyl methanamide

49) The IUPAC name of the compound



is

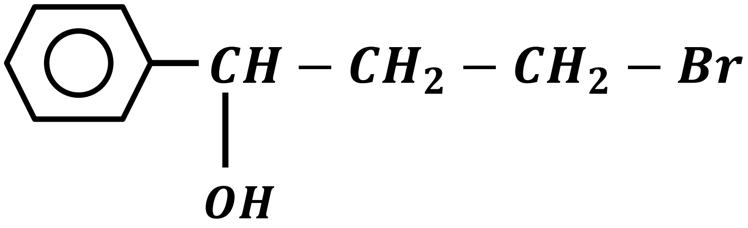
1) 3 – Methyl – 5 - heptanone

2) 5 – Methyl – 3 - heptanone

3) 5 – Ethyl – 5 - hexanone

4) 2 – Ethyl – 4 - hexanone

50) The IUPAC name of the compound



is

1) 3 – Bromo – 1 – phenyl – 1 - propanol

2) 1 – Bromo – 3 – phenyl – propan – 3 - ol

3) 3 – Bromo – 1 – hydroxy propyl benzene

4) 2 – Bromo – 1 – phenyl – propan – 1 - - ol

51) The IUPAC name of

$$\begin{array}{cc} CH & = CH \\ | & | \\ CHO & NH_2 \end{array}$$

is

1) 1 – Amino prop – 2- enal

2) 3 – Amino prop – 2 - enal

3) 1 – Amino – 2 – formyl ethane

4) 3 – amino – 1 – oxo prop – 2 - ene

OBJECTIVE QUESTIONS
PCQS

PCQS

1) The correct decreasing order of priority for the functional groups of organic compounds in the IUPAC system of nomenclature is

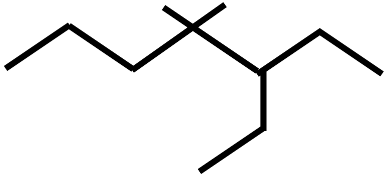
(AIEEE - 2008)

1) –COOH, $-SO_3H$, $-CONH_2$, -CHO

2) $–SO_3H$, -COOH, $-CONH_2$, -CHO

3) –CHO, -COOH, $-SO_3H$, $-CONH_2$

4) $–CONH_2$, -CHO, $-SO_3H$, -COOH

2) The IUPAC name of  is (AIEEE-2007)

1) 3-Ethyl-4, 4-dimethyl heptane

2) 1, 1-Diethyl-2, 2-dimethyl pentane

3) 4, 4-Dimethyl-5, 5-diethyl pentane

4) 5, 5-Diethyl-4, 4-dimethyl pentane

3) **The correct order of nucleophilicity among the following is**

(AIEEE-2005)

I) $CH_3\text{-}\overset{\displaystyle O}{\overset{\|}{C}}\text{-}O\text{-}$

II) $CH_3O\text{-}$

III) CN^-

IV) $CH_3\text{-}C_6H_4\text{-}SO_3^-$

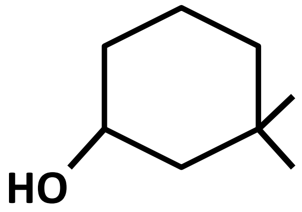
1) I > II > III > IV

2) IV > III > I > I

3) II > III > I > IV

4) III > II > I > IV

4) The IUPAC name of the compound (AIEEE-2007)



1) 3, 3-dimethyl-1-cyclohexanol

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

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

4) 1, 1-Dimethyl-3-cyclohexanol

5) Match the following (2004 M)

List-I	List-II
A) $R - CHO$	1) Aldehyde
B) $R - CO - R$	2) Nitrile
C) $R - CO_2H$	3) Ketone
D) $R - CN$	4) Ester
	5) Carboxylic acid

The correct answer is

1) A-1, B-3, C-5, D-2

2) A-3, B-1, C-5, D-2

3) A-1, B-2, C-3, D-4

4) A-4, B-1, C-5, D-3

6) 2, 3-dimethyl hexane contains….tertiary…secondary and ….primary carbon atoms, respectively (2003 E)

1) 2, 2, 4

2) 2, 4, 3

3) 4, 3, 2

4) 3, 2, 4

7) How many “methyl groups” are present in 2, 5 – dimethyl – 4 – ethyl heptane? (2003 E)

1) 2

2) 3

3) 4

4) 5

8) IUPAC name of $CH_3COCH(CH_3)_2$ is (A-2003)

1) 4-Methyl isopropyl ketone

2) 3-Methyl-2-butanone

3) Isopropyl methyl ketone

4) 2-Methyl -3- butanone

9) Arrangement of $(CH_3)_3C$-, $(CH_3)_2CH$-, CH_3-CH_2- when attached to benzyl or an unsaturated group in increasing order of inductive effect is (AIEEE 2002)

1) $(CH_3)_3C\text{-} < (CH_3)_2CH\text{-} < CH_3\text{-}CH_2$

2) $CH_3\text{-}CH_2\text{-} < (CH_3)_2CH\text{-} < (CH_3)_3C\text{-}$

3) $(CH_3)_2CH\text{-} < (CH_3)_3C\text{-} < CH_3\text{-}CH_2\text{-}$

4) $(CH_3)_3C\text{-} < CH_3\text{-}CH_2\text{-} < (CH_3)_2CH\text{-}$

10) Which is wrong IUPAC name (AIEEE-2002)

1) $CH_3CH_2CH_2COOCH_2CH_3$ (Ethyl butanoate)

2) CH_3CHCH_2CHO (3-methyl butanol)

$\quad\quad | $
$\quad\quad CH_3$

3) $CH_3\text{-}CH\text{-}CH\text{-}CH_3$ (3-methyl-2-butanol)

$\quad\quad | \quad\quad |$
$\quad\quad OH \quad CH_3$

4) $CH_3CHCOCH_2CH_3$ (2-methyl-3-pentanone)

$\quad\quad |$
$\quad\quad CH_3$

11) The homologue of ethyne is (2000 E)

1) C_2H_4

2) C_2H_6

3) C_3H_8

4) C_3H_4

12) **The structural Formula of 2-methyl-2-butene is….** **(2001 M)**

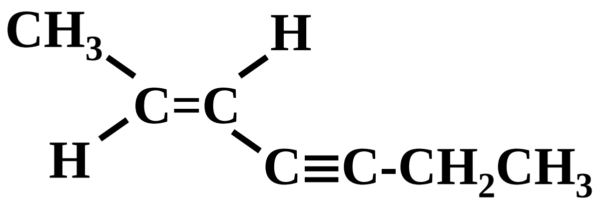
1) $CH_3\text{-}CH(CH_3)\text{-}CH{=}CH_2$

2) $CH_3\text{-}CH_2\text{-}C(CH_3){=}CH_2$

3) $CH_3\text{-}CH{=}CH\text{-}CH_3$

4) $CH_3\text{-}CH{=}C(CH_3)\text{-}CH_3$

13) The IUPAC name of the following compound is



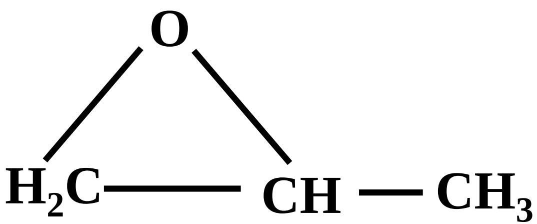
1) (E)-5-hptene-3-Yne

2) (Z)-5-hptene-3-Yne

3) (E)-2-hptene-4-Yne

4) (Z)-2-hptene-4-Yne

14) The IUPAC name of the compound



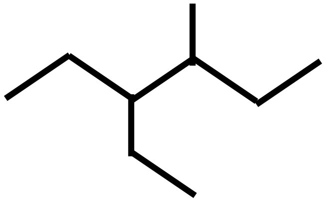
1) Propylene oxide

2) 1, 2, oxo propane

3) 1, 2-Epoxy propane

4) 1, 2-propoxide

15) The correct IUPAC name of the following compound



1) 4-Methyl-3-ethylhexane

2) 3-ethyl-4-methylhexane

3) 3, 4-ethylmethylhexane

4) 4-ethyl-3-methylhexane

OBJECTIVE QUESTIONS
LEVEL-I

LEVEL - I

1) Isomerism exhibited by methyl formate and acetic acid is

1) Geometrical

2) Stereo

3) Tautomerism

4) Functional

2) **Functional isomer of carboxylic acid is**

1) **Amide**

2) **Acid chloride**

3) **Fatty Acid**

4) **Alkylalkanoate**

3) The isomerism exhibited due to the difference in the size of the alkyl groups attached to the same functional group is

1) Tautomerism

2) Stereo isomerism

3) Metamerism

4) Optical Isomerism

4) Diethylether and n-propyl methylether are

1) Metamerism

2) Tautomers

3) Functional isomers

4) Optical isomers

5) The Type of isomerism that is not found in alkenes is…

1) Metamerism

2) Chain isomerism

3) Geometrical isomerism

4) Position isomerism

6) Among the following the pair that is not a pair of metamers is

1) $CH_3OCH_2CH_2CH$ & $CH_3CH_3OCH_2CH_3$

2) $CH_3CH_2OCH_2CH_3$ & $CH_3OCH(CH_3)_2$

3) $CH_3NHCH_2CH_2CH_3$ & $CH_3CH_2NHCH_2CH_3$

4) $CH_3NHCH_2CH_2CH_3$ & $CH_3NHCH\ (CH_3)_2$

7) Alkanols and Alkoxyalkanes are

1) Functional isomers

2) Keto-enol tautomers

3) Geometrical isomers

4) Not isomers at all

8) Ethylacetate and Methyl propionate are?

1) Functional isomers

2) Tautomers

3) Metamers

4) Position isomers

9) n-propyl alcohol and isopropyl alcohol are examples of…

1) Position isomerism

2) Chain isomerism

3) Tautomerism

4) Geometrical isomerism

10) Dimethylether is the isomer of

1) Diethylether

2) Methylalcohol

3) Methoxymethane

4) Ethylalcohol

11) Isomer of Diethylether is

1) $(CH_3)_3COH$

2) $(CH_3)_2CHOH$

3) C_3H_7OH

4) $(C_2H_5)_2CHOH$

12) Which of the following shows Metamerism?

1) $CH_3COC_3H_7$

2) $CH_3SC_2H_5$

3) $CH_3NHC_2H_5$

4) $C_2H_5OCH_3$

13) The number of structural alcoholic isomers for $C_4H_{10}O$ is

1) 2

2) 3

3) 4

4) 5

14) The number of primary alcoholic isomers with the formula $C_4H_{10}O$ is…

1) 1

2) 2

3) 3

4) 4

15) The total number of structural isomers for the compound of the formula $C_4H_{10}O$ is

1) 7

2) 6

3) 4

4) 3

16) The number of possible isomeric structures for the formula C_4H_{10} is….

1) 10

2) 1

3) 2

4) 4

17) Which of the following pairs exhibit isomerism?

1) Methane and Ethane

2) Chloroform and Carbon tetrachloride

3) Butane and 2-methyl butane

4) Dimethyl ether and Ethanol

18) The Compound $C_4H_{10}O$ can show..

1) Metamerism

2) Position isomerism

3) Functional isomerism

4) All the above types

19) The compound which is not isomeric with diethylether is

1) N-propyl methyl ether

2) Butan – 1-o1

3) 2-methylpropan-2-ol

4) Butanone

20) An organic compound of structure CH_3-CH_2-CH_2-CO-CH_3 shows functional isomerism with another organic compound of structural formula….

1) CH_3-CH_2-CO-CH_2-CH_3

2) $CH_3CH_2CH_2CH_2CHO$

3) CH_3-CH=CH-CH_2-CH_2OH

4) b & c

21) The total number of acyclic isomers for C_3H_4

1) 1

2) 2

3) 3

4) 4

22) The number of possible isomers for C_6H_{14} is…

1) 2

2) 3

3) 4

4) 5

23) **The number of Aromatic isomers for C_8H_{10} is…**

1) 1

2) 2

3) 3

4) 4

24) Which of the following does not exhibit functional isomerism?

1) C_2H_5OH

2) CH_3NH_2

3) CH_3COOH

4) CH_3CH_2CHO

25) Which of the following is the isomer of propanal ?

1) Propanone

2) Dimethyl ether

3) Ethyl methyl ether

4) Ethanol

26) The possible number of chain isomers for C_5H_{12} is …

1) 2

2) 3

3) 4

4) 5

27) The compound that exhibits metamerism is

1) CH_3 –CO –C_2H_5

2) C_2H_5 –S –C_2H_5

3) CH_3 –O –CH_3

4) C_2H_5 –O –CH_3

28) I-Butanol and 2-methyl propanol are a pair of which isomers

1) Position

2) Functional

3) Metamers

4) Chain

29) The number of monochloro derivatives of 3-hexyne are

1) 3

2) 2

3) 4

4) 5

30) Number of isomers having molecular formula C_3H_7Cl is….

1) 2

2) 3

3) 4

4) 5

31) $CH_3CH_2CH_2OH$ is a functional isomer of

1) $C_2H_5OCH_3$

2) $CH_3OC_3H_2$

3) $CH_3CH_2CH_2OCH_2CH_3$

4) $CH_3CHOHCH_3$

32) The number of isomeric amines possible for the formula C_3H_9N is …

1) 4

2) 3

3) 5

4) 6

33) Ortho, meta and para dichlorobenzenes are…

1) Chain isomers

2) Position isomers

3) Functional isomers

4) Tautomers

34) The number of ether isomers possible for the formula $C_4H_{10}O$

1) 7

2) 4

3) 3

4) 2

35) Number of non cyclic structural isomers excluding stereo isomers for C_3H_6O is …

1) 6

2) 3

3) 1

4) 4

36) Primary, secondary and tertiary amines are

1) Chain isomers

2) Position isomers

3) Functional isomers

4) Tautomers

37) Which pair of isomers given below are position isomers?

1) Propanal and propanone

2) n-Butyl alcohol and Isobutyl alcohol

3) 3° Butyl alcohol and Isobutyl alcohol

4) 2° Butyl alcohol and 3° Butyl alcohol

38) Which pair does not represent isomers?

1) CH_3COOH and $HCOOCH_3$

2) CH_3-CHO and CH_2=CH-OH

3) CH_3-CHO and CH_3-CO-CH_3

4) CH_3-CO-CH_3 and CH_3-CH_2-CHO

39) Number of isomers for the compound dihydroxy benzene

1) 1

2) 2

3) 3

4) 4

40) Total number of hybrid orbitals in 1,3-Butadiyne used for bonding

1) 4

2) 6

3) 12

4) 8

41) Number of Structural isomers with the formula $C_4H_{11}N$ is …

1) 2

2) 8

3) 6

4) 5

42) The molecular formula of a saturated compound is $C_2H_4Br_2$
This formula permits the existence of

1) Functional isomers

2) Optical isomers

3) Positional isomers

4) cis – trans isomers

43) Which of the following structures permit cis trans isomerism?

1) $X_2C = CY_2$

2) $XYC{=}CZ_2$

3) $X_2C = CXY$

4) $XYC = CXY$

44) Which of the following compound shows geometrical isomerism

1) 2 – butenal

2) 2 – butene

3) 1, 2 dichloro cyclo propane

4) all

45) Maleicacid and Fumaric acids are

1) Tautomers

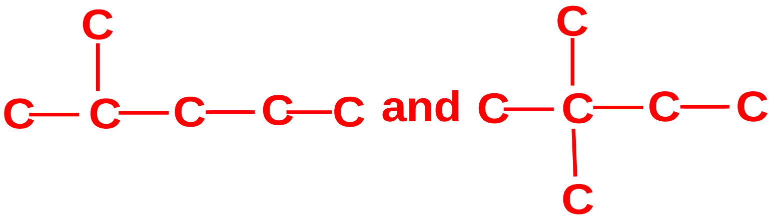
2) Geometrical isomers

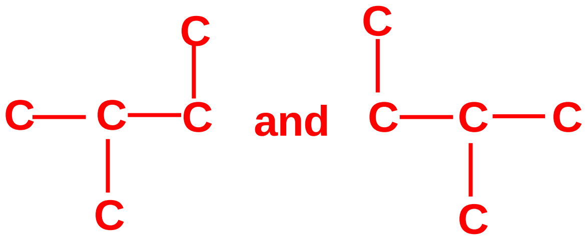
3) Chain isomers

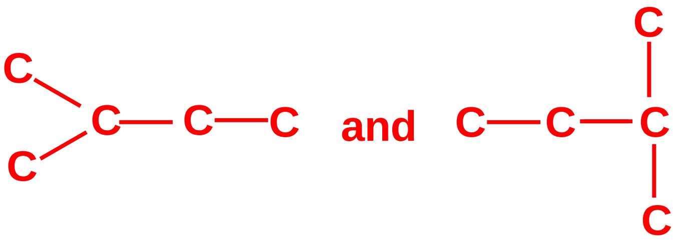
4) Functional isomers

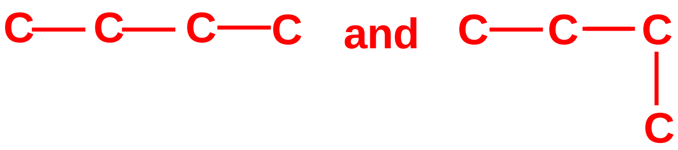
OBJECTIVE QUESTIONS
LEVEL-II

1) Which is the example of branch isomerization

1) 

2) 

3) 

4) 

2) Isomers have essentially identical

1) Structural Formula

2) Chemical Properties

3) Molecular Formula

4) Physical Properties

3) Which of the following is an optically active compound?

1) CH_3-CH_2-COOH

2) CH_3-CHOH-COOH

3) HOOC-CH_2-COOH

4) CH_3-CO-COOH

4) Which of the following has Chiral centre

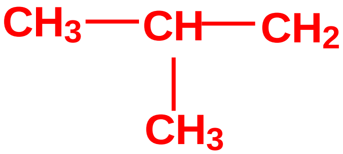
1) $CH_3 - \overset{\overset{\displaystyle CH_3}{|}}{CH} - CH_2COOH$

2) $CH_3 - CH = CH - CH_3$

3) $CH_3 - \overset{\overset{\displaystyle CH_3}{|}}{CH} - CH_2OH$

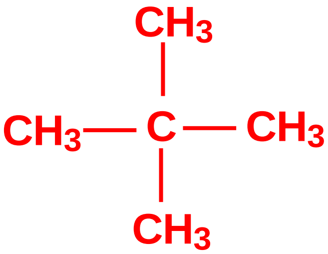
4) $CH_3 - CHOH - CH_2CH_3$

5) Which one of the following pairs is an example of position isomerism

1) $CH_3-CH_2-CH_2-CH_3$ and 

2) $CH_3-CH_2-CH=CH_2$ and $CH_3-CH=CH-CH_3$

3) CH_3-CH_2OH and CH_3-O-CH_3

4)  and $CH_3-CH_2-CH_2-CH_2-CH_3$

6) Goemetrical isomerism is shown by

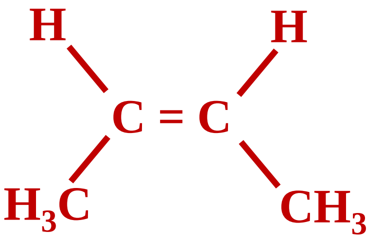
1) 2 – butene

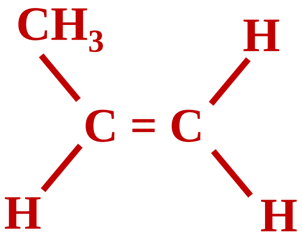
2) 2 – butyne

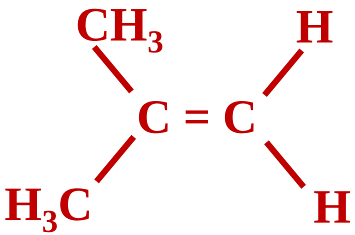
3) 2 – butanol

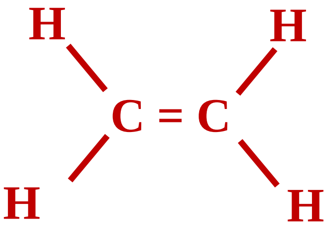
4) Butanol

7) Which one of the following exhibits geometrical isomerism

1) 

2) 

3) 

4) 

8) How many isomers of $C_5H_{11}OH$ will be primary alcohols?

1) 2

2) 3

3) 4

4) 5

9) **Which of the following can exhibit cis-trans isomerism?**

1) $HC \equiv CH$

2) $ClCH = CHCl$

3) $CH_3CHCl.COOH$

4) $ClCH_2\text{-}CH_2Cl$

10) Which of the following Pairs represents the steroisomerism?

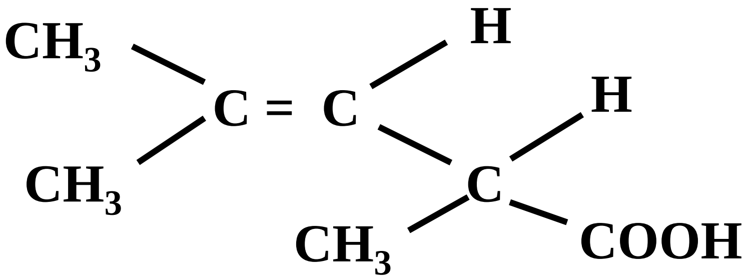
1) Geometrical isomerism, Position isomerism

2) Geometrical isomerism, Functional isomerism

3) Optical isomerism, Geometrical isomerism

4) Optical isomerism, metamerism

11) The following compound can exhibits



1) Tautomerism

2) Optical isomerism

3) Geometrical isomerism

4)Geometrical and Optical isomerism

12) Which of the following Pair is not isomeric compounds?

1) Ethyl ethanoate and methyl propanoate

2) Butanone and Butanal

3) Ethoxy propane and Propoxy ethane

4) Methoxy methane and ethanol

13) Optically active isomers but not mirror images are called…

1) Enantiomers

2) Mesomers

3) Tautomers

4) Diastereomers

14) Which of the following is expected to be optically active?

1) $(CH_3)_4C$

2) $C_2H_5CH(CH_3)C_3H_7$

3) $(C_2H_5)_2CHCH_3$

4) $CH_3CH{=}CHCH_3$

15) Which compound does not show geometrical isomerism?

1) 2-butene

2) 2-Pentene

3) 2,3-dibromo-2-butene

4) 2-methyl propane

16) Which is optically active?

1) CH_2Cl_2

2) $CHCl_3$

3) Meso form of tartaric acid

4) Glyceraldehyde

17) The number of optical isomers of glucose

1) 8

2) 12

3) 16

4) Cannot be determined

18) A similarity between optical and geometrical is that

1) Each forms equal number of isomers for a given compound

2) It in a compound one is present then so is the other

3) Both are included in stereo isomerism

4) They have no similarity

19)Racemic mixture is formed by mixing two….

1) Isomeric Compounds

2) Chiral Compounds

3) Meso Compounds

4) Optical isomers

20) Which of the following does not show geometrical isomerism?

1) 1, 2–dichloro –1–pentene

2) 1, 3–dichloro – 2–Pentene

3) 1, 1–Dichloro– 1–Pentene

4) 1, 4–dichloro–2–Pentene

21) Which of the following compound is Chiral?

1) 1-Chloro-2-methyl butane

2) 2-methyl butane

3) 2-methyl butene

4) 2-methyl propane

22) Isomers of propionic acid are

1) $HCOOC_2H_5$ and CH_3COOCH_3

2) $HCOOC_2H_5$ and $C_3H_7COOCH_3$

3) $C_3H_7COOCH_3$ and C_3H_7OH

4) $C_3H_7OH_3$ and CH_3OCH_3

23) Statement –I : Propane has no structural isomers

Statement –II : Propane is saturated hydrocarbon

1) Statement I is true, Statement II is true, Statement II is the correct explanation for Statement I.

2) Statement I is true, Statement II is true, Statement II is not the correct explanation for Statement I.

3) Statement I is true, Statement II is false.

4) Statement I is false, Statement II is true.

24) Statement –I : N-Ethyl ethanamine and methyl n-propyl amine are a pair of metamers.

Statement –II : The two compounds differ in functional groups

1) Statement I is true, Statement II is true, Statement II is the correct explanation for Statement I.

2) Statement I is true, Statement II is true, Statement II is not the correct explanation for Statement I.

3) Statement I is true, Statement II is false.

4) Statement I is false, Statement II is true.

25) Statement –I : The number of isomeric amines possible for the formula C_3H_9N is four

Statement –II : Primary, Secondary and tertiary amines are functional isomers

1) Statement I is true, Statement II is true, Statement II is the correct explanation for Statement I.

2) Statement I is true, Statement II is true, Statement II is not the correct explanation for Statement I.

3) Statement I is true, Statement II is false.

4) Statement I is false, Statement II is true.

OBJECTIVE QUESTIONS
LEVEL-III

1) The restricted rotation about carbon-carbon-double bond in 2-butene is due to

1) Over lap of two p-orbitals

2) Overlap of one p and one sp^2 – hybridized orbitals

3) Overlap of two sp^2 – hybridized orbitals.

4) Overlap of one s and one sp^2 – hybridized orbitals.

2) Which organic structure among the following is not an isomer of the compound $CH_3 – CO – CH_2CH_2CH_2CH_3$?

1) $CH_3CH_2OCH = CHCH_2CH_3$

2) $CH_3CH = CHCH_2CH_2CHO$

3) $(CH_3)_2CH – CO – CO\text{-}CH_2CH_3$

4) $CH_3CH_2COCH_2CH_2CH_3$

3) The number of possible alkynes with molecular formula C_5H_8 is

1) 2

2) 3

3) 4

4) 5

4) The total number of isomers for C_4H_8

1) 5

2) 6

3) 7

4) 8

5) The number of possible open chain (acyclic) isomeric compounds for molecular C_5H_{10}

1) 8

2) 7

3) 6

4) 5

6) A compound with molecular formula C_7H_{16} shows optical isomerism, the compound will be

1) 2, 3-dimethylpentane

2) 2, 2-dimethylpentane

3) 2-methylhexane

4) None of these

7) The Number of geometrical isomers of $CH_3-CH=CH-CH=CH-CH=CHCl$

1) 2

2) 4

3) 6

4) 8

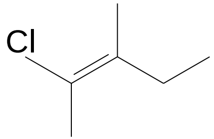
8) Which of the following is the most stable form of cyclohexane?

1) Boat

2) Chair

3) Twist Boat

4) Half Chair

9) The configuration of the compound 

1) E

2) Z

3) Both

4) None

10) Ethylidene bromide and ethylene bromide are

1) Chain isomers

2) Positional isomers

3) Functional isomers

4) Metamers

11) **The number of enantiomers of the compound $CH_3CHBrCHBrCOOH$ is**

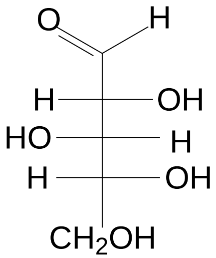
1) 0

2) 1

3) 3

4) 4

12) What is the R and S configuration for each sterogenic centre in this form top to bottom?



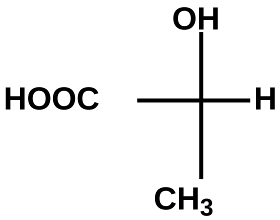
1) R.R.R

2) R.S.S

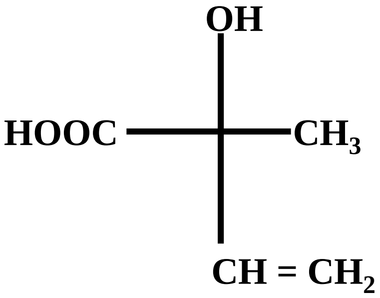
3) R.S.R

4) S.S.R

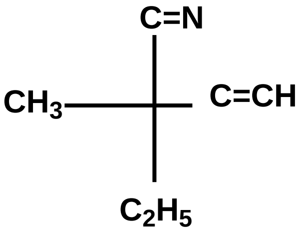
13) The following compounds A, B, C have R or S configuration



(A)



(B)



(C)

1) R, R, S

2) R, S, S

3) R, S, R

4) S, S, R

14) The number of structurally isomeric dibromo derivatives of C_4H_{10}

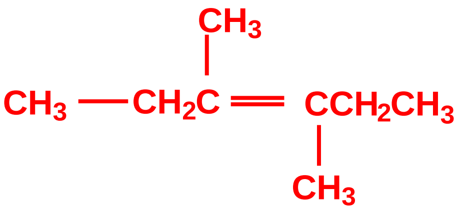
1) 3

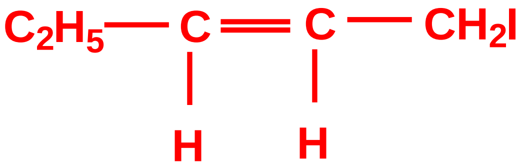
2) 6

3) 9

4) 8

15) **Gemoetrical isomerism is not shown by**

1) 

2) 

3) $CH_2=C(Cl)CH_3$

4) $CH_3\text{-}CH=CH\text{-}CH=CH_2$

16) How many structural formulae are possible for $C_5H_{11}Cl$

1) 6

2) 8

3) 4

4) 2

17) The total number of optically active isomers for $CH_2OH(CHOH)_3CHO$ are

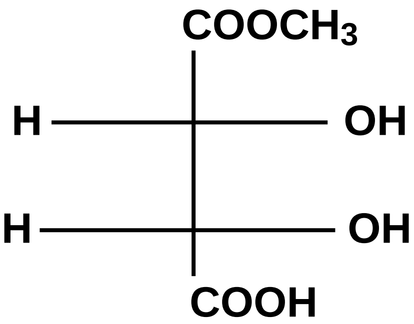
1) 16

2) 8

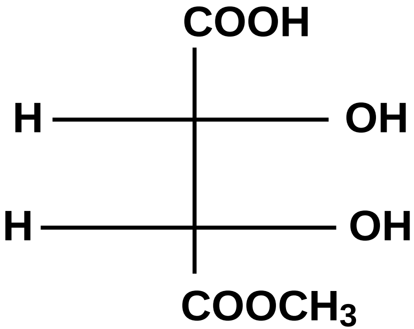
3) 4

4) 2

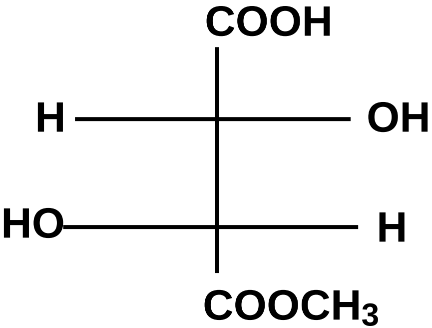
18) The following compounds A,B,C have R or S configuration



(A)



(B)



(C)

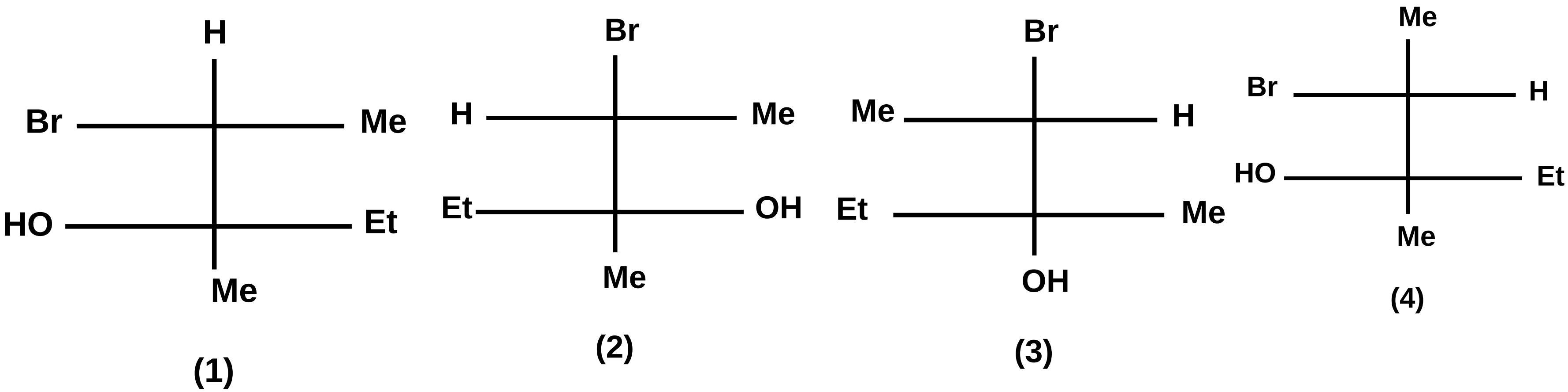
1) A and B are identical

2) A and B are diastereomers

3) A and C are enantiomers

4) A and B are enantiomers

19) Which of the following structures are super imposable?



1) 1 and 2

2) 2 and 3

3) 1 and 4

4) 1 and 3

20) The number of asymmetric carbon atoms and the number of optical isomers in $CH_3(CHOH)_2COOH$ are respectively

1) 3 and 4

2) 1 and 3

3) 2 and 4

4) 2 and 3

21) The number of optical enantiomorphs of tartaric acid

1) 3

2) 2

3) 4

4) 1

22) Which of the following compounds will exhibit geometrical isomerism ?

1) 1- Phenyl -2-butene

2) 3-Phenyl-1-butene

3) 2-Phenyl-1-butene

4) 1,1-Diphenyl-1-propene

23) Isopetane can form four structurally isomeric mono bromo derivatives. How many of them are optically active?

1) 1

2) 2

3) 3

4) None of these

24) Which of the following is optically active?

1) Glycerine

2) Acetaldehyde

3) Glyceraldehyde

4) Acetone

25) Mesotartaric acid is optically inactive due to the process of

1) Centre of symmetric

2) Internal balancing of rotation

3) Plane of symmetry

4) All

26) D-lactic acid and L-lactic acid are example of

1) Racemic mixtures

2) Diastereomers

3) Metamers

4) Enantiomers

27) Optically active isomers but not mirror images are called

1) Enatiomers

2) Mesomers

3) Diasteriomers

4) Tautomers

28) An organic compound will show optical isomers if

1) All the groups attached to carbonatom are same

2) Four groups attached to carbonatom are different

3) Three groups attached to carbonatom are different

4) Two groups attached to carbonatom are different

29) The property by which a compound can turn the plane polarized light is known as

1) Photolysis

2) Phosphorescence

3) Optical Activity

4) Polarisation

30) A compound contains two dissimilar asymmetric carbonatoms, the number of optical isomers is

1) 2

2) 4

3) 3

4) 5

31) Chiral molecules are those which are

1) Non superimposable on their mirror image

2) Superimposable on their mirror image

3) Exhibiting geometrical isomerism

4) Unstable molecules

32) The isomerism exhibited by $CH_3CH(OH)COOH$ is

1) Position isomerism

2) Stereoisomerism

3) Optical isomerism

4) Cis-trans isomerism

33) The optically active compound among these

1) 1 –Butanol

2) 2 –Butanol

3) 2-Methyl-Propanol - 1

4) 2-Methyl-2-Propanol

34) The process of separation of racemic mixture into d & *l* enantiomers is called

1) Resolution

2) Dehydration

3) Revolution

4) Hydration

35) Rotation of plane polarized light can be measured by

1) Manometer

2) Galvanometer

3) Polarimeter

4) Viscometer

36) Which type of isomerism is shown by lactic acid?

1) Geometrical isomerism

2) Tautoisomerism

3) Optical isomerism

4) Metamrism

37) Which one of the following is an optically active compound?

1) N-Propanol

2) 2-Chlorobutane

3) N-butanol

4) 4-hydroxyheptane

38) Which one of the following compounds shows optical isomerism?

1) $CH_3CHCl-CH_2-CH_3$

2) $CH_3-CH_2-CHCl-CH_2-CH_3$

3) $ClCH_2-CH_2-CH_3$

4) $ClCH_2-CH_2-CH_3$

39) Total number of isomers of a disubstituted benzene is

1) 1

2) 2

3) 3

4) 4

40) Separation of d and l enantiomorphs from a racemic mixture is called

1) Resolution

2) Dehydration

3) Rotation

4) Dehydrohalogenation

41) The number of optical isomers for lactic acid is

1) 1

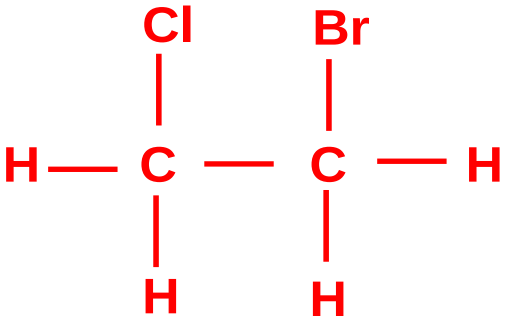
2) 2

3) 3

4) 4

42) Which one of the following contains asymmetric carbon atom

1)



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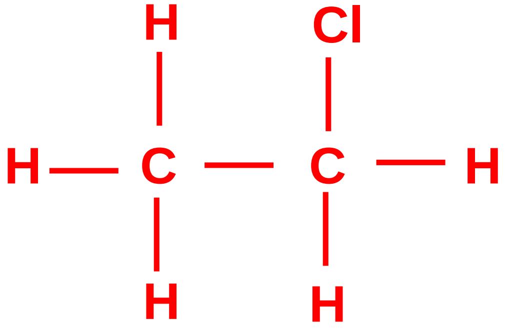
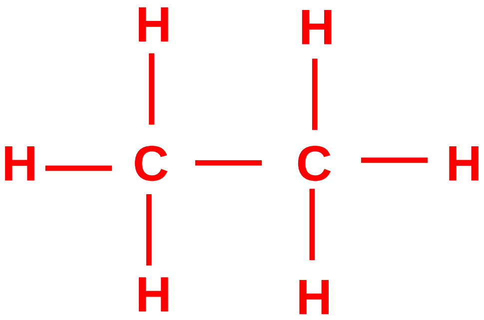
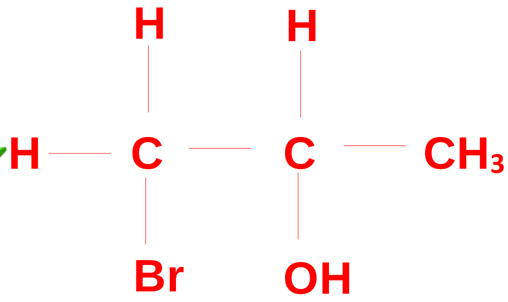


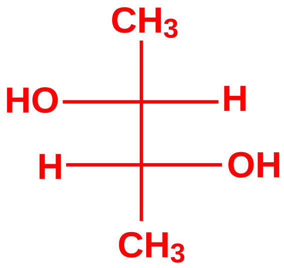
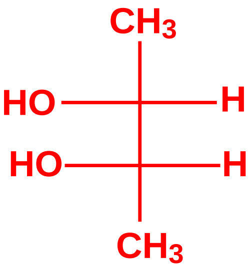
3)

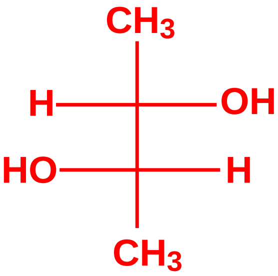
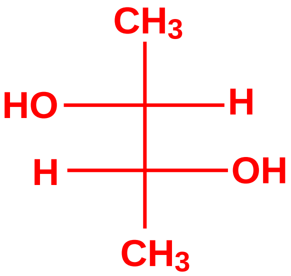


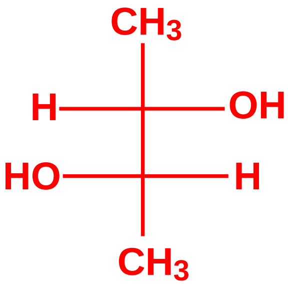
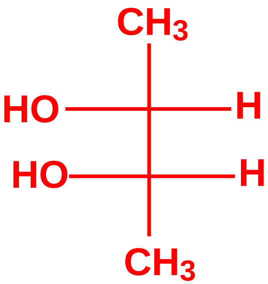
4) ✓

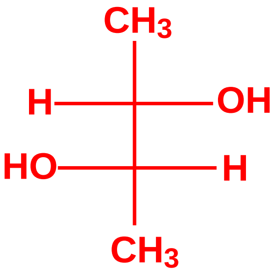
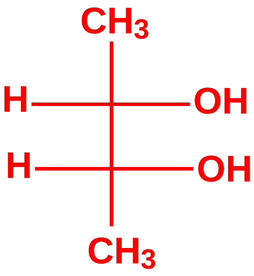


43) Which one of the following compounds are enantiomers

1)  and 

2)  and 

3)  and 

4)  and 

PREVIOUS COMPETITIVE QUESTIONS

1) **Which one of the following acids does not exhibit optical isomerism?** **(J.M.O.L– 2014)**

1) Lactic Acid

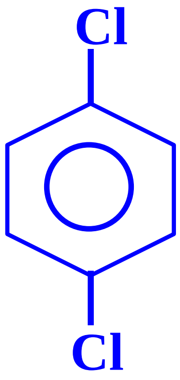
2) Tataric Acid

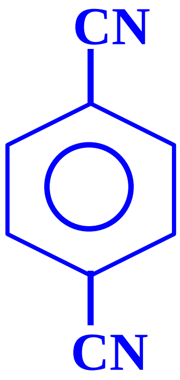
3) Maleic Acid

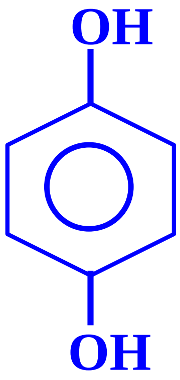
4) α-Amino Acids

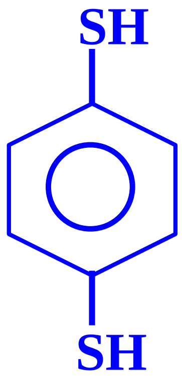
2) For which of the following molecule significant $\mu \neq 0$?

(JEE MAINS – 2014)

a) 

b) 

c) 

d) 

1) Only a

2) a and b

3) Only c

4) c and d

3) Which of the following complex species is not expected to exhibit optical isomerism ? **(JEE MAINS – 2013)**

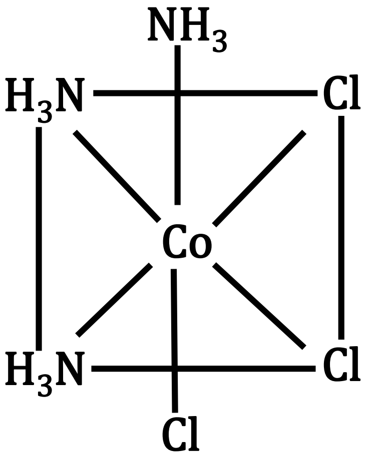
1) $[Co(en)_2Cl_2]^+$

2) $[Co(NH_3)_3Cl_3]$

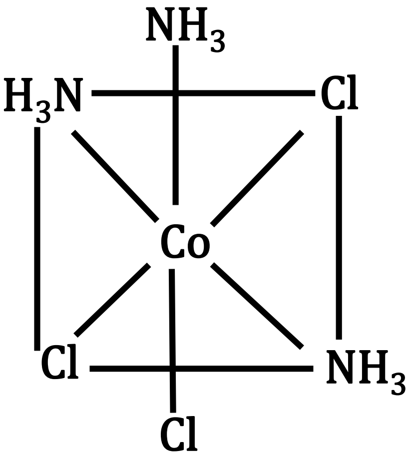
3) $[Co(en)(NH_3)_3Cl_2]^+$

4) $[Co(en)_3]^{3+}$

Solution : $[Co(NH_3)_3Cl_3]$ **exists in two forms (facial and meridonial)**



Facial



Meridonial

Both of these forms are achiral. Hence $[Co(NH_3)_3Cl_3]$ **does not show optical isomerism.**

KEY : 2

4) In which of the following properties, the two enantiomers of lactic acid differ from each other? (E – 2013)

1) Sign of specific rotation

2) Density

3) Melting point

4) Refractive index

5) How many chiral compounds are possible on monochlorination of 2-methylbutane? **(AIEEE– 2012)**

1) 4 **2) 6** **3) 8** **4) 2**

6) Match the following **(EAMCET– 2012)**

List - I	List - II
(1) Acetaldehyde, Vinyl alcohol	(I) Enantiomers
(2) Eclipsed and staggered ethane	(II) Tautomers
(3) (+) 2-Butanol, (-) 2-Butanol	(III) Chain isomers
(4) Methyl-n-Propylamine and Diethylamine	(IV) Conformational isomers
	(V) Metamers

The Correct answer is

	(1)	(2)	(3)	(4)
1)	II	IV	III	V
2)	II	IV	I	V
3)	V	I	IV	II
4)	V	I	III	II

7) The number of stereoisomers possible for $H_3C\text{-}CH(OH)\text{-}CH(OH)\text{-}CH_3$

(EAMCET – 2011)

1) 1

2) 2

3) 3

4) 4

8) Identify the compound that exhibits tautomerism

(AIEEE– 2010)

1) Phenol

2) 2. Butene

3) Lactic Acid

4) 2.Pentanone

9) Which of the following pairs of 2, 3-butane diol is enantiometric?

(EAMCET – 2010)

1) 2R, 3R and 2S, 3S

2) 2S, 3S and 2S, 3R

3) 2R, 3R and 2R, 3S

4) 2S, 3S and 2R, 3S

10) Which of the following reacts with water to give ethane ?

(2010E)

1) CH_4

2) C_2H_5MgBr

3) C_2H_5OH

4) $C_2H_5 – O – C_2H_5$

11) An isomer of 1-butanol is

(2001E)

1) 2-methyl-2-butanol

2) 2-methyl-1-butanol

3) 3-methyl-2-butanol

4) 2-methyl-1-propanol

12) **A pair of functional isomers** **(2001E)**

1) $CH_3CH_2CH_2OH$, $CH_3CH(OH)CH_3$

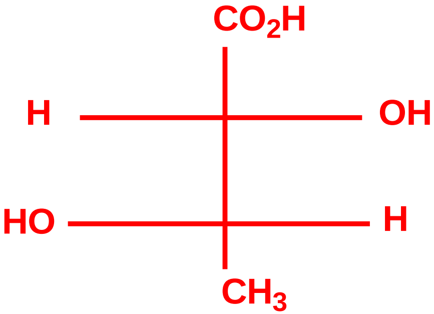
2) $CH_3CH_2CH_2CH_2OH$, $(CH_3)_2CHCH_2OH$

3) $CH_3CH_2CH_2OH$, $CH_3CH_2CH_2Cl$

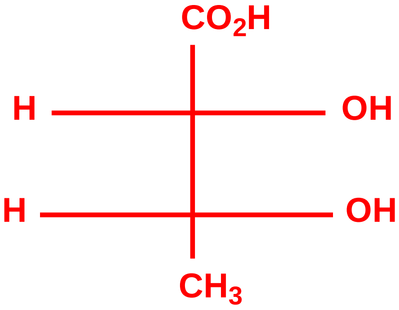
4) $CH_3CH_2CH_2OH$, $CH_3\text{-}O\text{-}CH_2CH_3$

13) The correct Fischer projection formula of (2R, 3R) – 2, 3 – dihydroxy butanoic acid is

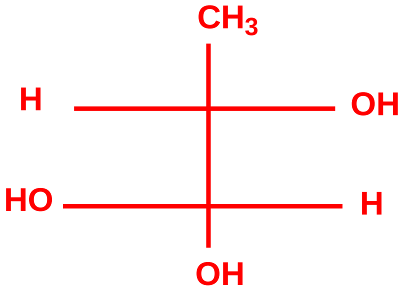
1)



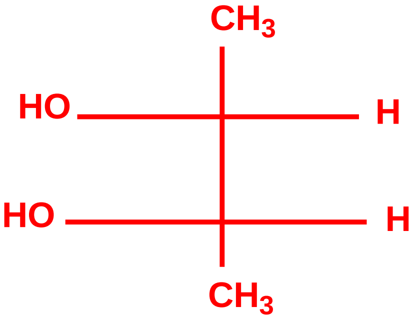
2)



3)



4)



14) Maleic acid and funmaric acids are

1) Chain isomers

2) Geometrical isomers

3) Functional isomers

4) Tautomers

15) The optical inactive compound from the following as

(J.M.O.L – 2015)

1) 2-Chlorobutane

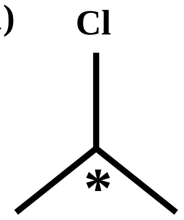
2) 2-Chloropropanal

3) 2-Chloro -2-methylbutane

4) 2-Chloropeptane

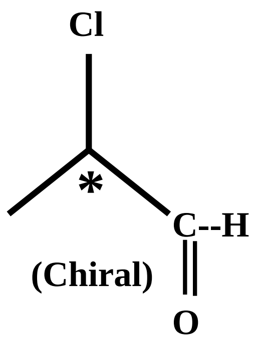
Solution :

(1)



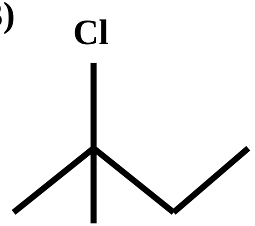
(Chiral)

(2)



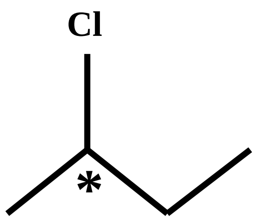
(Chiral)

(3)



(Achiral)

(4)

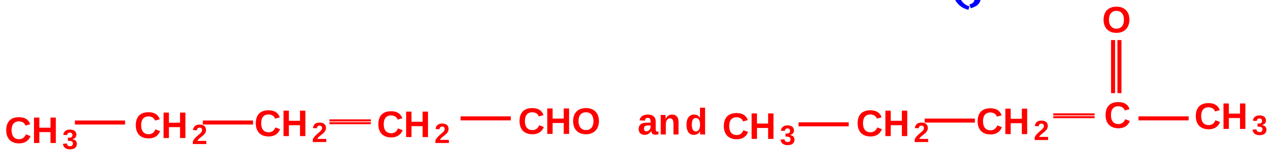


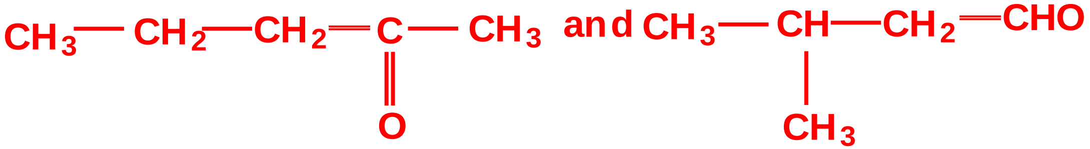
(Chiral)

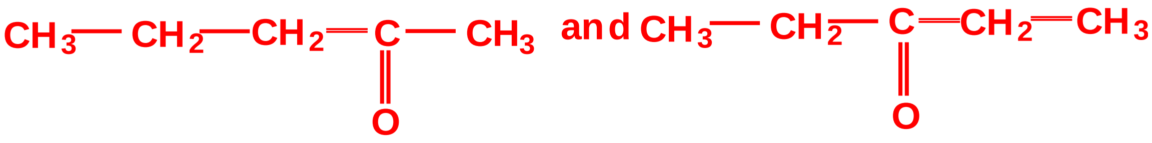
KEY : 3

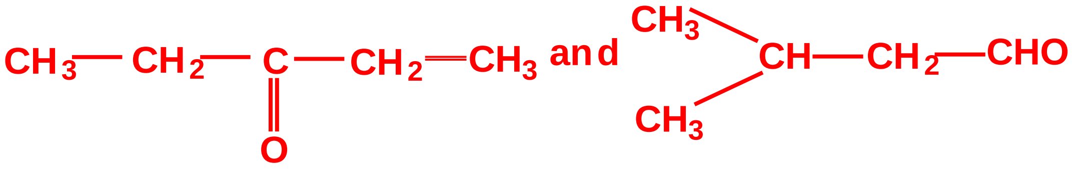
16) Which of the following pairs of compounds are positional isomers

(J.M.O.L. – 2015)

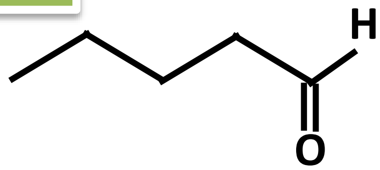
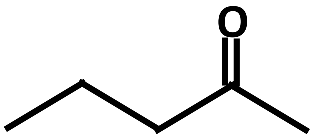
1) 

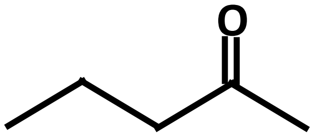
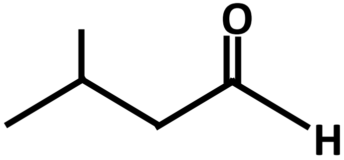
2) 

3) 

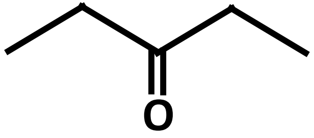
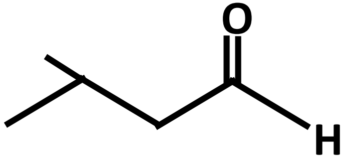
4) 

Solution :

1)  and  are functional isomers

2)  and  are functional isomers

3) $CH_3\text{-}CH_2\text{–}\overset{\overset{\displaystyle O}{\|}}{C}\text{-}CH_2\text{-}CH_3$ and $CH_3\text{-}\overset{\overset{\displaystyle O}{\|}}{C}\text{-}CH_2\text{-}CH_2\text{-}CH_3$ are positional isomers

4)  and  are functional isomers

KEY : 3

17) The number of structural organisation isomers for C_6H_{14} is

(J.M.O.L. – 2015)

1) 3

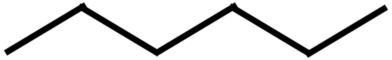
2) 4

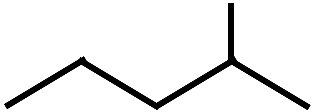
3) 5

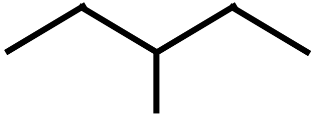
4) 6

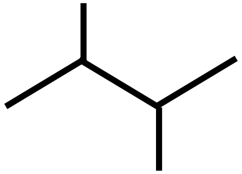
Solution :

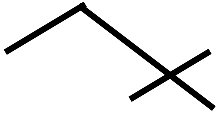
C_6H_{14} isomers are





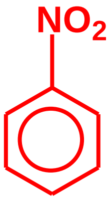


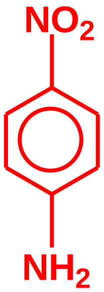


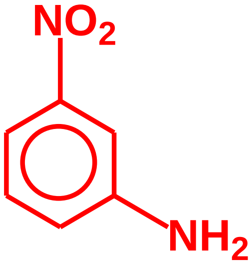


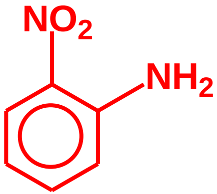
KEY : 3

18) Which compound exhibits maximum dipole moment among the following? **(J.M.O.L. – 2015)**

1) 

2) 

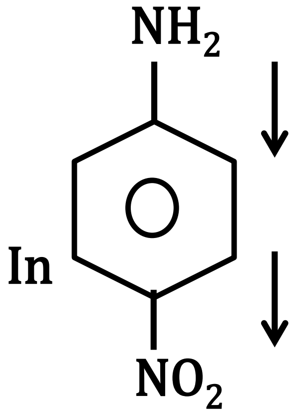
3) 

4) 

Solution :

Dipole moment

$\propto e^-$ transfer (or) e^- delocalisation



e^- transfer is maximum

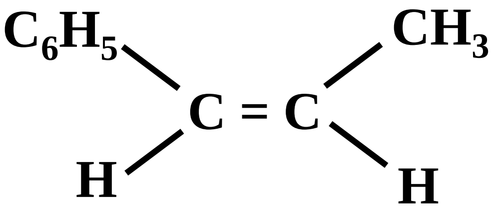
KEY : 2

19) Which of the following compound will exhibit geometrical isomerism? **(JEE MAINS– 2015)**

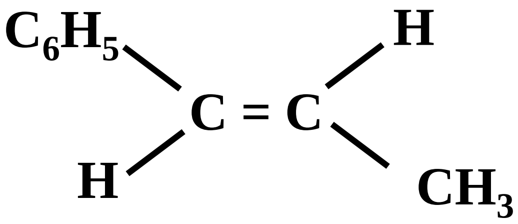
1) 1-Phenyl-2-butene **2) 3Phenyl-1-butene**

3) 2-Phenyl-1-butene **4) 1,1-Diphenyl-1-propane**

Solution :



Cis



Trans

OBJECTIVE QUESTIONS
LEVEL-I

LEVEL - I

1) The electrophile among these

1) RO^-

2) BF_3

3) NH_3

4) R - OH

2) The number of electrons in central atom of free radical $CH_3^{\bullet}$ is…

1) 6

2) 7

3) 8

4) 10

3) The carbocation among these

1) $\dot{C}(CH_3)_3$

2) $\bar{C}(CH_3)_3$

3) $(CH_3)_3\,C^+$

4) $(CH_3)_4\,C$

4) The most reactive free radical among these

1) Tert-Butyl

2) Sec- Butyl

3) Isobutyl

4) N-Butyl

5) The species having maximum number of electron pairs on the central atom is

1) Free radical

2) Carbanion

3) Carbocation

4) Carbene

6) The geometry of an alkyl carbanion is...

1) Trigonal pyramidal

2) Tetrahedral

3) Planar trigonal

4) Square

7) The correct order of stability of alkyl carbanions among these

1) $CH_3^- > 1^0 > 2^0 > 3^0 >$

2) $3^0 > 2^0 > 0^0 > CH_3^-$

3) Same as that of alkyl carbocation

4) Same as that of alkyl free radicals

8) The reaction intermediate among these

1) Methyl free radical

2) Methyl cation

3) Methyl anion

4) All the above

9) Which of the following is more stable than the remaining three?

1) T-Butyl carbanion

2) Isobutyl carbanion

3) Methyl carbanion

4) Ethyl carbanion

10) **Which of the following should be the type of hybridization and geometry of tertiary butyl carbocation?**

1) **sp, pyramidal**

2) **sp^2, square planar**

3) **sp^2 , trigonal planar**

4) **$sp^{3,}$ regular tetrahedral**

11) Which of the following has same geometry as that of methyl carbanion

1) NH_3

2) H_2O

3) CCl_4

4) $:CCl_2$

12) Which of the following free radical has less or low reactivity than the remaining three?

1) $\dot{C}H_3$

2) $(CH_3)_3\,\dot{C}$

3) $CH_3\text{-}\,\dot{C}\,H_2$

4) $(CH_3)_2\,\dot{C}\,H$

13) Which of the following types of hybridization is there on the charged carbon atom of ethyl carbanion?

1) Sp

2) SP^3

3) SP^2

4) dSP^2

14) Which of the following is an example of a carbanion?

1) $:CH_2$

2) $\overset{-}{C}H_3$

3) $\overset{+}{C}H_3$

4) $\overset{\bullet}{C}H_3$

15) The geometry of the charged carbon atom in allyl cation is

1) Liner

2) Trigonal planar

3) pyramidal

4) Tetrahedral

16) Which of the following is an electrophile?

1) Lewis acid

2) Lewis base

3) Negative species

4) None of these

17) One p atomic orbital of carbon remains unused in

1) SP^3

2) SP

3) SP^2

4) All of these

18) In the following reaction , the hybridization of carbon changes from :$C_2H_4 + H_2 \rightarrow C_2H_6$

1) SP^2 to SP

2) SP to SP^2

3) SP^3 to SP

4) SP^2toSP^3

19) Heterolysis of C - Cl bond in t-Butyl Chloride gives …

1) t - Butyl carbanion and chlorine free radicals

2) t - Butyl carbanion and chloronium ion

3) t - Butyl carbonium ion and chloride ion

4) Isobutyl carbonium ion and chloride ion

20) The homolytic cleavage of covalent bond gives

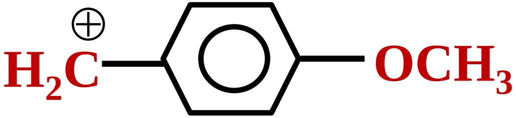
1) Carbanion ion

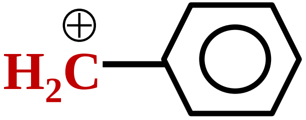
2) Carbanion

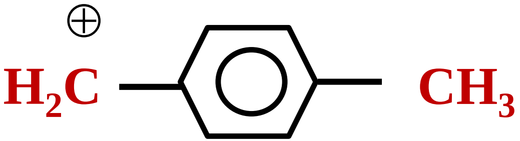
3) Free radical

4) Nine of these

21) Consider the following carbocation

a) 

b) 

c) 

d) $CH_3-\overset{\oplus}{C}H_2$

the relative stabilities of these carbocation's are such that

1) d < b < c < a

2) b < d < c < a

3) d < b < a < c

4) b < d < a < c

22) In BF_3, $SnCl_2$ and $SnCl_4$ which one behave as a Lewis acid ?

1) Stannous chloride, stannic chloride

2) BF_3, stannous chloride

3) Only BF_3

4) BF_3, stannous chloride, stannic chloride

REAGENTS

23) Electrophiles are always

1) Positively charged

2) Negatively charged or neutral

3) Neutral

4) Neutral or positively charged

24) Which of the following is an example of a nucleophile

1) Fluoride ion

2) Hydronium ion

3) Chlorine atom

4) Aniline hydrochloride

25) Which of the following reagent attacks first after heterolysis of a carbonyl group?

1) Electron pair acceptor

2) One electron donor

3) One electron acceptor

4) Electron pair donor

26) Which of the following electrophilic species can nitrate benzene ring

1) Nitric acid

2) Nitrite ion

3) Nitrate ion

4) Nitronium ion

27) Which of the following species does not attack aromatic ring?

1) SO_3

2) CH_3^+

3) O_2

4) Cl^+

28) Which of the following species can act as an electron deficient reagent

1) Acetate ion

2) Methyl carbanion

3) Methoxide ion

4) Dichlorocarbene

29) What is the attacking reagent in the reaction of CH_3-CH=CH_2 and HC*l*?

1) H^+

2) Cl^-

3) H^-

4) HC*l*

30) Which of the following has the highest nucleophile

1) F^-

2) OH^-

3) CH_3^-

4) NH_2^-

31) Which of the following not a nucleophile ?

1) CN^{-}

2) OH^{-}

3) NH^{3}

4) BF_3

32) Which of the following is not a nucleophile ?

1) H_2O

2) CH_3 OH

3) H_2

4) NH_3

33) When $CHCl_3$ reacts with alcoholic KOH, the electrophile formed is...

1) $^{+}CHCl_2$

2) $:CCl_2$

3) $CHCl_2$

4) CCl_4

ELECTRONIC DISPLACEMENTS

34) Which of the following is basically a temporary effect ?

1) Electrometric effect

2) Inductive effect

3) Hyper conjugation

4) Mesomeric effect

35) Which of the following is the fundamental cause of electron donor effect of alkyl radicals?

1) +I Effect

2) +R Effect

3) Hyper conjugation

4) Electromeric Effect

36) The most acidic among these

1) CH_3 COOH

2) F - CH_2 - COOH

3) Cl - CH_2 -COOH

4) CF_3COOH

37) which of the following properties of ethylamine makes it a stronger base than aniline ?

1) Positive inductive effect

2) High steric hindrance

3) Mesomeric effect

4) Presence of lone pair

38) which statements is false in regarding resonance ?

1) Increase stability of molecule

2) It create same type of bond

3) Increase reactivity of molecule

4) Decrease reactivity of molecule

39) The reason of resonance is…

1) Delocalisation of sigma electrons

2) Delocalisation of pi electrons

3) Migration of H-atom

4) Migration of proton

40) All bonds in benzene are equal due to

1) Tautomer's

2) I – effect

3) Resonance

4) Isomerism

41) Among the following, the strongest base is …

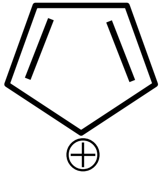
1) $C_6H_5NH_2$

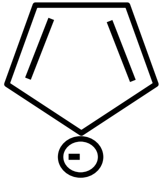
2) $p - NO_2 - C_6H_4NH_2$

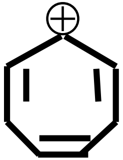
3) $m - NO_2 - C_6H_4NH_2$

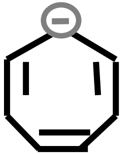
4) $C_6H_5CH_2NH_2$

42) Which of the following is more stable carbonion?

a) 

b) 

c) 

d) 

Select the correct answer using the codes given below:

1) a 2) d 3) b 4) a, b, c

43) In HC≡C^-(acetylide ion) and $CH_2 = CH^-$(vinylanion)

1) HC ≡ $C^-$is less basic

2) HC ≡ C^- is more basic

3) Basic strength is the same

4) None

44) In which of the following compounds carbon chlorine bond distance is minimum

1) CH_3 -Cl

2) C_6H_5 -CH_2 -Cl

3) CH_2 = CH - Cl

4) CH_2 = CH - CH_2 -Cl

45) Hydrogen attached to SP^3 carbon in cyclopentadien can be easily removed as

1) Hydride ion

2) Hydrogen molecule

3) Proton

4) Hydrogen atom

46) Which of the following has the most acidic proton?

1) CH_3COCH_3

2) $(CH_3)_2C = CH_2$

3) $CH_3COCH_2COCH_3$

4) $(CH_3CO)_3CH$

47) Which of the following statements is false about resonance contribution structures

1) Contribution structures contribute to the resonance hybrid in proportion of their relative energies

2) Equivalent contributing structures make the resonance very important

3) Contributing structures represent molecules having no real existence

4) Contributing structures are less stable than the reasoned hybride

48) Which of the following is correct, regarding the-I-effect of the substitutents?

1) $-NR_2 < -OR < -F$

2) $-NR_2 > -OR < -F$

3) $-NR_2 < -OR > -F$

4) $-NR_2 > -OR > -F$

49) The arrangement of $(CH_3)_3C-$, $(CH_2)_2CH-$, CH_3CH_2- when attached to benzene or an unsaturated group in increasing order of inductive effect is

1) $(CH_3)_3C- < (CH_3)_2CH- < CH_3CH_2-$

2) $CH_3CH_2- < (CH_3)_2CH- < (CH_3)_3C-$

3) $(CH_3)_2CH- < (CH_3)_3C- < CH_3CH_2-$

4) $(CH_3)_3C- < CH_3CH_2- < (CH_3)_2CH-$

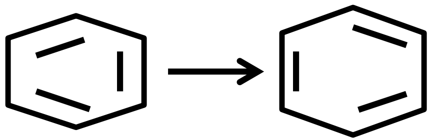
50) Which of the following statements regarding the resonance energy of benzene is correct?

1) The energy is required to break the C – H bond in benzene

2) The energy is required to break the C – C bond in benzene

3) The energy is a measure of stability of benzene

4) The energy is required to convert



TYPES OF REACTIONS:

51) The typical reaction of olefinic bond is

1) Electrophilic substitution reactions

2)Electrophilic addition reactions

3) Nucleophilic substitution reactions

4) Nucleophilic addition reaction

52) The formation of cyanohydrin from a ketone is an example of

1) Electrophilic addition

2) Nucleophilic addition

3) Nucleophilic substitution

4) Electrophilic substitution

53) The addition of HCN to a carbonyl compound is an example of

1) Nucleophilic substitution

2) Electrophilic addition

3) Nucleophilic addition

4) Electrophilic substitution

54) The reaction $CH_2 = CH – CH_3 + HBr \rightarrow CH_3CHBr – CH_3$ is…

1) Nucleophilic addition

2) Electrophilic substitution

3) Electrophilic addition

4) Free radical addition

55) The reaction $(CH_3)_3C - Br \xrightarrow{H_2O} (CH_3)_3C - OH$ is…

1) Elimination reaction

2) Substitution reaction

3) Free radical reaction

4) Displacement reaction

56) Which of the following is the representative reaction of alkenes and alkynes

1) Electrophilic addition

2) Electrophilic substitution

3) Nucleophilic addition

4 Free radical addition

57) Which of the following is the chain propagation step in chlorination of methane?

1) $\dot{C}H_3 + \dot{C}l \longrightarrow CH_3Cl$

2) $\dot{C}H_3 + Cl - Cl \longrightarrow CH_3 - Cl + \dot{C}l$

3) $Cl - Cl \longrightarrow \dot{C}l + \dot{C}l$

4) $\dot{C}l + \dot{C}l \longrightarrow Cl_2$

58) What type of reaction is the formation of p aminophenol from N phenyl hydroxylamine

1) Elimination

2) Electrophilic substitution

3) Free radical rearrangement

4) molecular rearrangement

59) The representative reaction of carbonyl compounds is

1) Electrophilic addition

2) Nucleophilic substitution

3) Free radical addition

4) Nucleophilic addition

60) Conversion of n – hexane to 3 – methyl pentane is known as

1) Addition

2) Isomerization

3) Substitution

4) methylation

61) An example of nucleophilic addition is…

1) $CH_2 = CH_2 + HOCl \rightarrow CH_2OH - CH_2Cl$

2) $CH_2 = CH_2 + HBr \rightarrow CH_3 - CH_2 - Br$

3) $CH_3 - CH = O + CH_3MgBr \rightarrow CH_3 - \underset{\substack{| \\ CH_3}}{CH} - OMgBr$ ✓

4) $CH_3 - CH = CH_2 + HI \rightarrow CH_3 - CHI - CH_3$

62) Which of the following ion is most stable?

1) $CH_3\overset{+}{C}H_2$

2) $CH_3-\overset{+}{C}H-CH_3$

3) $CH_3-\overset{+}{C}(CH_3)-CH_3$

4) $CH_3-C(CH_3)_2-\overset{+}{C}H_2$

63) The halogenation of alkane is the example of

1) Electrophilic substitution

2) Nucleophilic substitution

3) Free radical Substitution

4) Oxidation

64) Which is not nucleophile reagent in the following ?

1) NH_3

2) $\overset{+}{C}H_3$

3) Br^-

4) H_2O

65) Which structure have sp hybrid carbon atom in the following

1) CH_2 =CCl – CH = CH_2

2) CCl_2 = CCl_2

3) CH_2 =C =CH_2

4) CH_2 =CH – CH =CH_2

66) The reaction of ethyl iodide with alc . KOH gives

1) C_2H_5OH

2) C_2H_2

3) C_2H_4

4) c_2H_6

67) The use of alc. KOH is

1) Dehydrogenation

2) Dehalogenation

3) Dehydration

4) Dehydrohalogenation

68) $C_6H_6 + CH_3Cl \longrightarrow C_6H_5 - CH_3 + HCl$ is an example of…

1) Electrophilic substitution

2) Free radical substitution

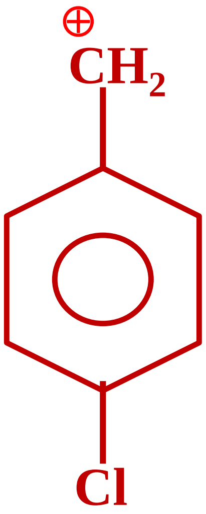
3) Nucleophilic substitution

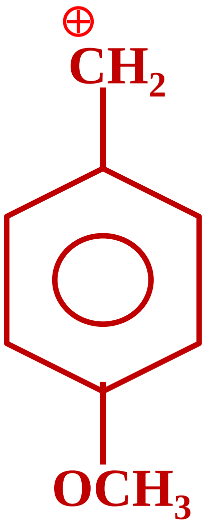
4) Free radical addition

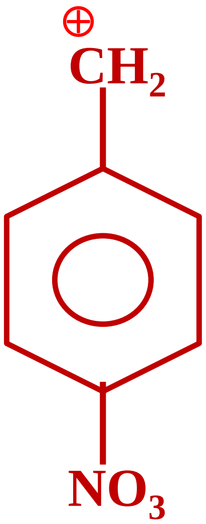
OBJECTIVE QUESTIONS
LEVEL-II

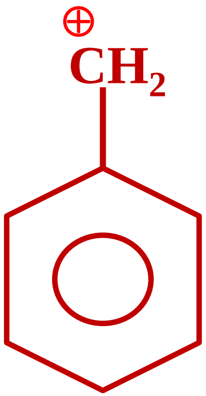
LEVEL - II

1) Most stable carbanion is…

1) 

2) 

3) 

4) 

2) Most stable carbanion is…

1) $CH \equiv \overline{C}$

2) $CH_2 = C\overline{H}$

3) $CH_3 - \overline{C}H_2$

3) $\overline{C}_6H_5$

3) Heterolytic fission of an organic covalent bond gives only

1) Free radicals

2)Both cation and anion

3) Only cation

4) Only anion

4) Which of the following gives most stable carbocation intermediate during their dehydration

1) $(CH_3)_2$ CH -OH

2) $(CH_3)_3$ C -OH

3) CH_3-CH_2-OH

4) CH_3-CH_2 $-$O -$CH_2 - CH_3$

5) Which of the following carbonium ion is most stable -

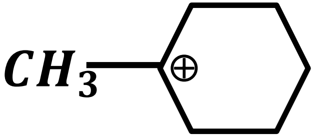
1) Ph_3C^+

2) $(CH_3)_3\ C^+$

3) $(CH_3)_2\ CH^+$

4) CH_2= CH-CH_2^+

6) $CH_3CH_2\,CH_2CH_2-\overset{\oplus}{C}H_2$, $CH_3-\underset{\underset{H}{|}}{\overset{\oplus}{C}}-CH_3$, $CH_3CH_2\,CH_2-\overset{\oplus}{C}H-CH_3$,



Of these carbocations

1) One is secondary carbocation

2) One is tertiary carbocation

3) Two are primary carbocation

4) Two are tertiary carbocation

7) Carbanion is…

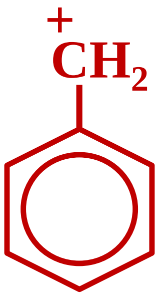
1) Base

2) Nucleophile

3) Both 1 & 2

4) Electrophile

8) Which of the following carbocation is least stable

1) 

2) $\overset{+}{C}H = CH_2$

3) CH2=CH-$\overset{+}{C}H_2$

4) $CH_3\text{-}\underset{\underset{H}{|}}{\overset{\overset{CH_3}{|}}{C}}{}^{+}$

9) Rearrangement is property of

1) carbanion

2) Carbocation

3) Carbon free radical

4) None of the above

10) Which of the following statement is correct

1) Allyl carbonium ion ($CH_2 =$ CH - CH_2^+) is more stable than propyl carbonium

2) Propyl carbonium ion is more stable than allyl carbonium ion

3) Both are equally stable

4) None of these

11) The relative stability order of carbanions $\mathrm{CH}\equiv C^{-}$, CH_3^{-} and $CH_2=CH^{-}$ is

1) $\mathrm{CH}\equiv C^{-} > CH_2=CH^{-} > CH_3^{-}$

2) $CH_3^{-} > CH_2=CH^{-} > \mathrm{CH}\equiv C^{-}$

3) $\mathrm{CH}\equiv C^{-} < CH_2=CH^{-} > CH_3^{-}$

4) $CH_2=CH^{-} < \mathrm{CH}\equiv C^{-} < CH_3^{-}$

12) In which of the following alcohols C-O bond breaks (heterolytically) with greatest eases:

1) $CH_3CH_2CH_2OH$

2) $$\begin{array}{ccccc} & & CH_3 & & \\ & & | & & \\ CH_3 & - & CH & - & OH \end{array}$$

3) $$\begin{array}{ccccc} & & CH_3 & & \\ & & | & & \\ CH_3 & - & CH & - & OH \\ & & | & & \\ & & CH_3 & & \end{array}$$

4) $$\begin{array}{ccccccc} & & CH_3 & & & & \\ & & | & & & & \\ CH_3 & - & C & - & CH_2 & - & OH \\ & & | & & & & \\ & & CH_3 & & & & \end{array}$$

13) The shape of carbonium ion is…

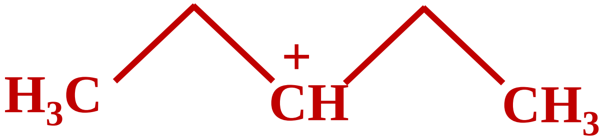
1) planar

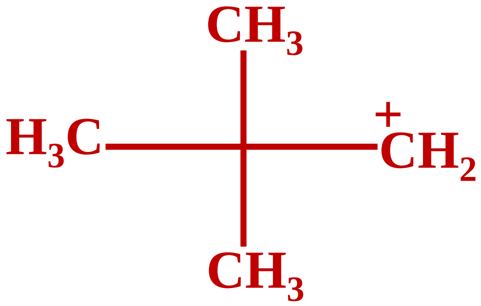
2) Linear

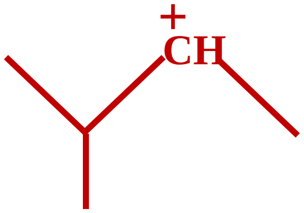
3) Pyramidal

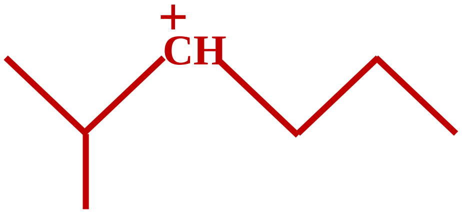
4) Tetrahedral

14) Which carbocation is less stable ?

1) 

2) 

3) 

4) 

REAGENTS

15) Which of the following is strongest nucleophile ?

1) Br^-

2) OH^-

3) CN^-

4) $C_2H_5O^-$

16) Which of the following is a pair of nucleophiles

1) Br^-, BF_3

2) $C_2H_5S^-$ $AlCl_3$

3) $ZnCl_2$

4) Br^-, Cl^-

17) Carbine is an important reagent for the following

1) Methylation

2) Insertion

3) Carbonylation

4) Acetylation

18) **Nucleophilicity order is correctly represented by…**

1) $CH_3^- < NH_2^- < HO^- < F^-$

2) $CH_3^- \approx NH_2^- > HO^- \approx F^-$

3) $CH_3^- > NH_2^- > HO^- > F^-$

4) $NH_2^- > F^- > HO^- > CH_3^-$

ELECETRONIC DISPLACEMENTS

19) Decreasing order of – I effect of the triad [- NO_2, -CH_3, -CN] is…

1) –CH_3 > -NO_2 > -CN

2) –CH_3> -CN>-NO_2

3) –CN > -NO_2 > -CH_3

4) –NO_2 > -CN > -CH_3

20) Which one of the following order is correct regarding the +m effect of the substituents

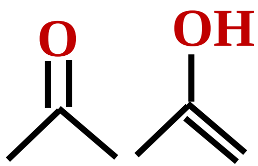
1) -NR_2<-OR> -F

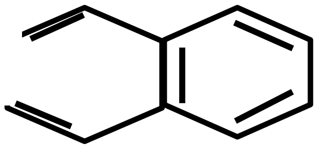
2) -NR_2 > -OR < -F

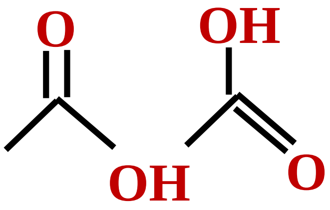
3) -NR_2 < -OR < -F

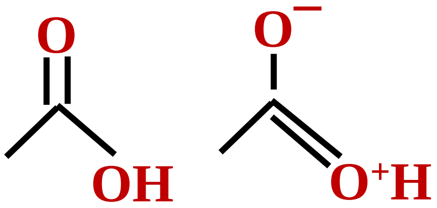
4) -NR_2 >-OR > -F

21) Which of the following pair represents resonating structures…

1) 

2) 

3) 

4) 

22) H_2C – C - CH_3 and H_2C = C - CH_3

1) Resonating structures

2) Tautomers

3) Geometrical isomers

3) Optical isomers

23) Resonance structures of a molecule should have

1) Identical arrangement of atoms

2) Nearly the same energy content

3) The same number of paired electrons

4) All

24) Hyper Conjugation can explain…

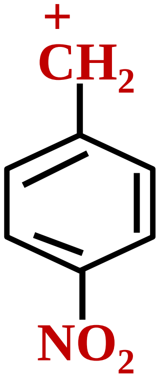
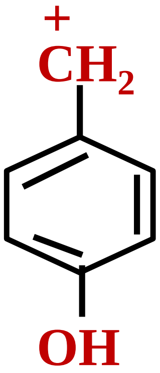
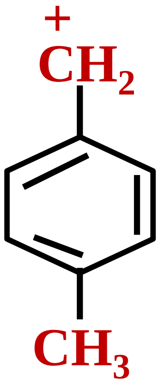
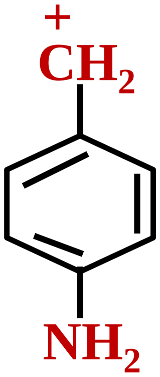
1) Stability of free radicalds

2) Stability of carbocations

3) Stability of alkenes

4) All

25) Arrange the following in the increasing order of their stability…

I)  II)  III)  IV) 

1) $\mathrm{I}<\mathrm{II}<\mathrm{III}<\mathrm{IV}$ 2) $\mathrm{II}<\mathrm{I}<\mathrm{III}<\mathrm{IV}$ 3) $\mathrm{I}<\mathrm{III}<\mathrm{II}<\mathrm{IV}$ 4) $\mathrm{II}<\mathrm{III}<\mathrm{I}<\mathrm{IV}$

26) Which of the following structure will have positively charged carbon?

1) H – C = N = O

2) H – C ≡ N - O

3) H- C ≡ N = O

4) H – C = N O

27) Which of the following structure will have positively charged carbon?

1) $CH_2 = \mathrm{CH} - \mathrm{Cl}$

2) $\bar{C}H_2$ - CH =Cl^+

3) $\overset{+}{C}H_2$ - CH – Cl

4) All have equal stability

28) Resultant dipole moment is associated with

1) Carbon tetrachloride

2) 1,4 dichlorobenzene

3) Trans 1,2 dichloromethane

4) 1,2 dichlorobenzene

29) The kind of delocalization involving sigma bond orbitals is called

1) Inductive effect

2) Hyper conjugation effect

3) Electrometric effect

4) Mesomeric effect

30) In which of the following resonance will be possible…?

1) $CH_2 = CH – CH_2 - CHO$

2) $CH_2 = CH – CH = O$

3) CH_3COCH_3

4) $CH_2 = CH – CH_2 - CH = CH_2$

31)The reaction :

$$2CH_3 - \dot{C}H_2 \longrightarrow CH_3 - CH_3 + CH_2 = CH_2$$ is called as…

1) Combination

2) Disproportionation

3) Abstraction

4) Addition

32) Which of the following is least reactive in a nucleophilic substitution reaction?

1) $(CH_3)_3\,C - Cl$

2) $CH_2 = CHCl$

3) CH_3CH_2Cl

4) $CH_2 = CHCH_2Cl$

33) Which of the following does not represent the example of nucleophilic substitution reaction?

1) $CH_3CH_2CHO + Br_2 \rightarrow CH_3CH(Br)CHO + HBr$

2) $CH_3COCl + NaOH \rightarrow CH_3COOH + NaCl$

3) $CH_3CH_2Cl + NaC \equiv CH \rightarrow CH \equiv C-CH_2CH_3$

4) $CH_3Cl + KOH\ (aq) \rightarrow CH_3OH + KCl$