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*.

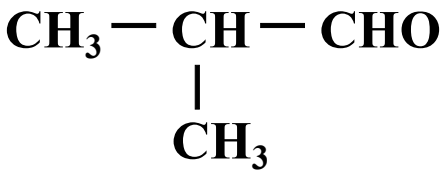
Examples are

(i) C_4H_{10}; $CH_2CH_2CH_2CH_3$ **n - Butane** **and** $CH_3-CH(CH_3)-CH_3$ **Iso-butane**

(a) Chain isomerism

(ii) C_4H_8O; $CH_3CH_2CH_2CHO$ and

Butanal



2- Methylpropanal

(b) Position isomerism

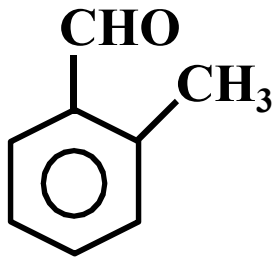
Compounds having same molecular formula but differ in the position of substituents or multiple bond or functional groups are known as position isomers and the phenomenon is known as *position isomerism*.

Examples are

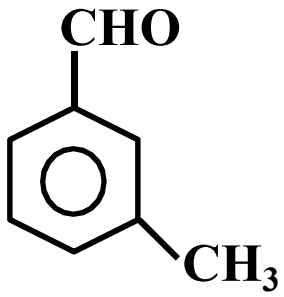
(i) C_4H_8; $CH_3CH_2CH{=}CH_2$, $CH_3{-}CH{=}CH{-}CH_3$

1- Butene **2-butene**

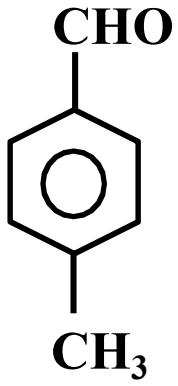
(b) Position isomerism



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

Propanone

(c) Functional isomerism:

(iii) $CH_2 = CHCH_2OH$

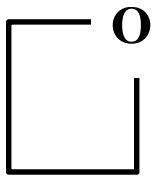
Prop-2-en-1-ol

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

Methoxyethene

Cyclic isomers:

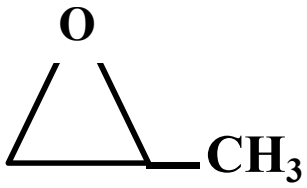
(v)



Oxetane

(1,3- Epoxy propane)

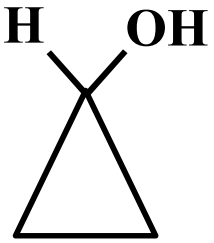
(vi)



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*.

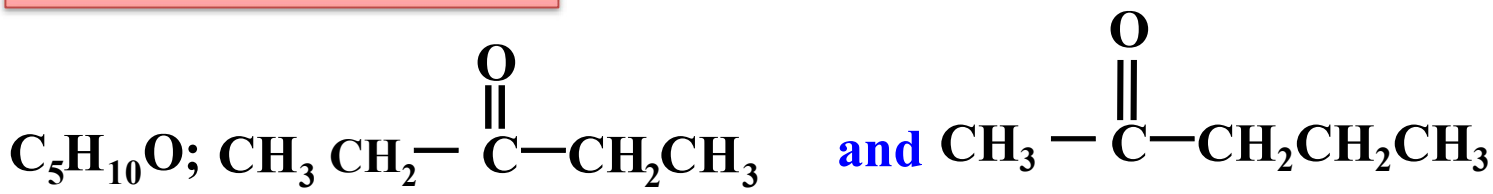
Examples are

$C_4H_{10}O$; $CH_3CH_2-O-CH_2CH_3$, $CH_3-O-CH_2CH_2CH_3$

EthoxyEthane

MethoxyEthane

(d) Metamerism



Pentan-3-one Pentan-2-one

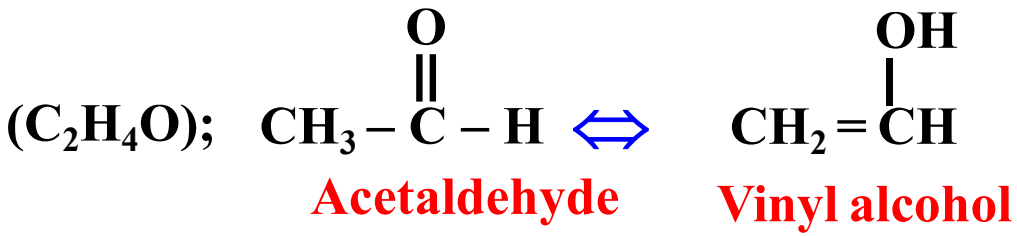
Compounds having – O –, – S –, – C –, – NH –, – C – O – Functional groups only exhibit metamerism.

(e) Tautomerism

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

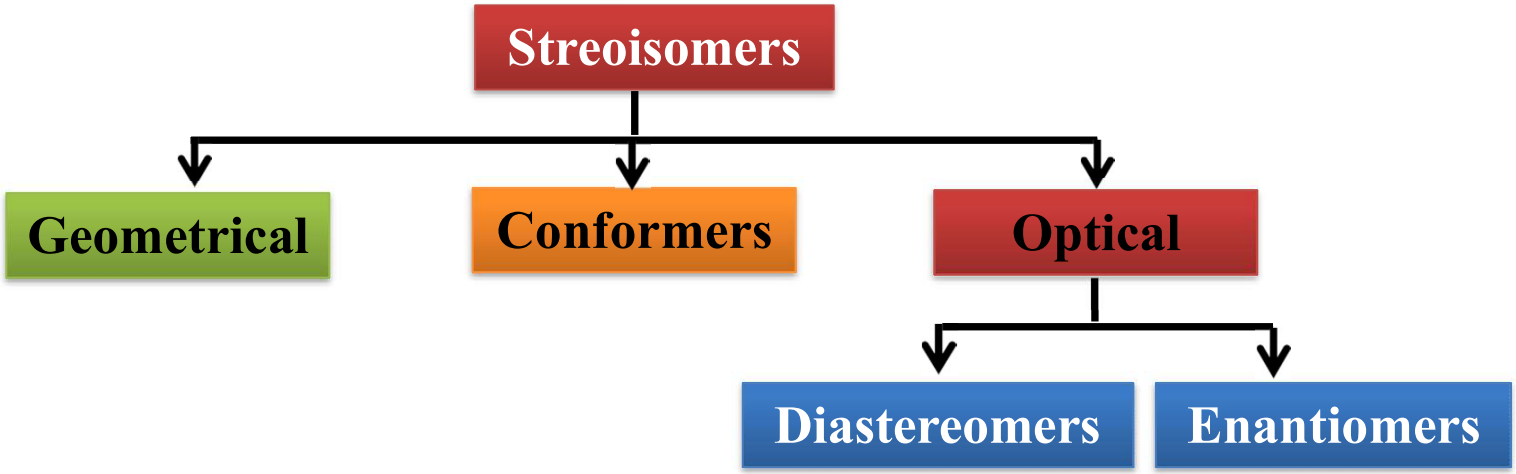
Examples are

Aldehydes and ketones show tautomerism. For example



STREOISOMERS

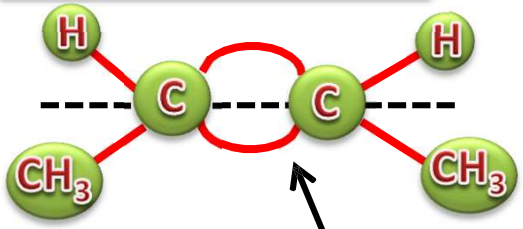
- **Isomers having same molecular formula but differing in 3 dimensional orientation of their atoms in a space are called stereoisomers and the phenomenon is known as *stereoisomerism*.**



Geometrical isomerism

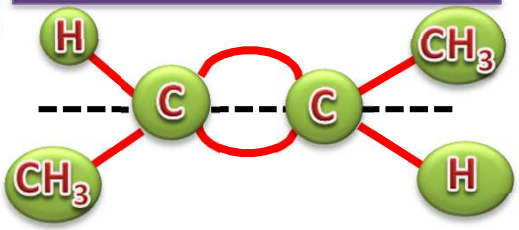
- It describes the relative orientation of functional group within a molecule. It is also called *cis-trans isomerism.*

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.

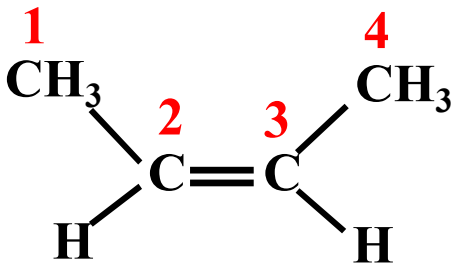
2) Trans – isomer :-



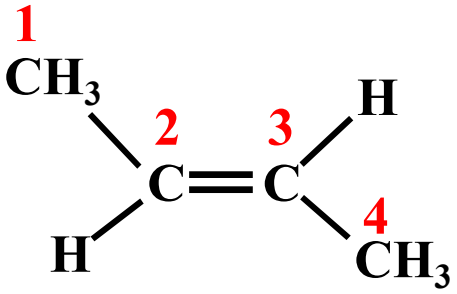
The isomers in which two identical atoms or groups lie on the OPPOSITE side of the double bond is called **Trans**-isomer.

Geometrical isomerism

E.g



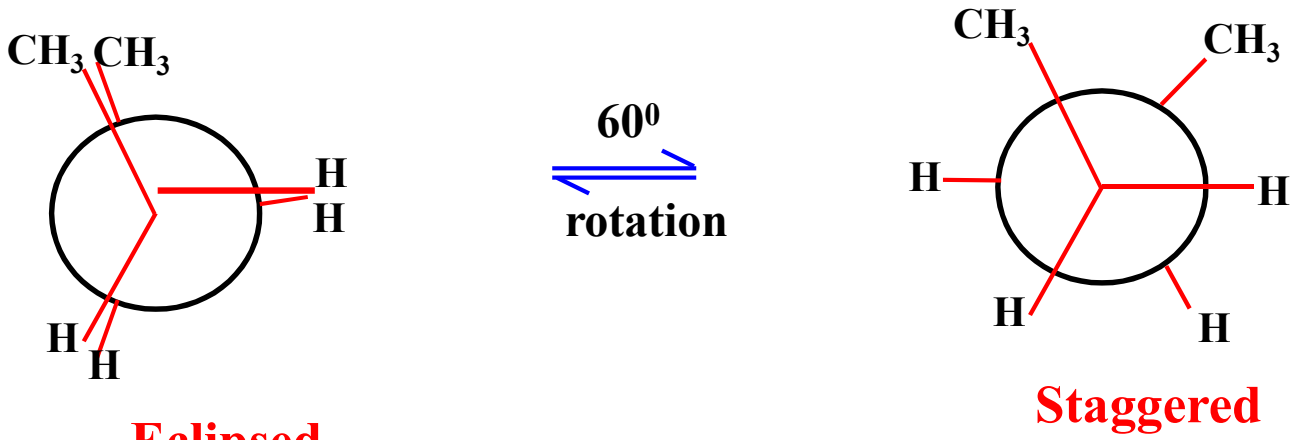
cis -But-2-ene



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

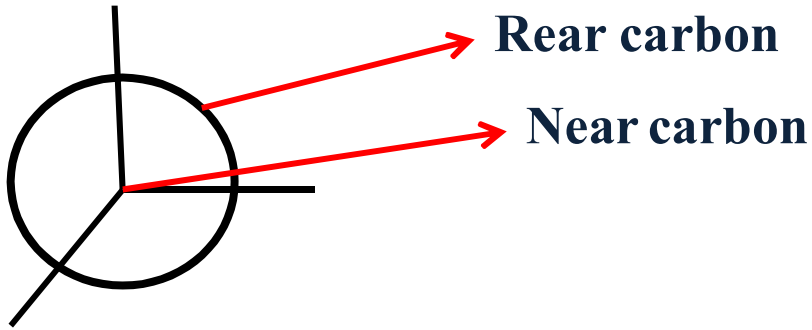
- The molecule is viewed at the C – C bond head on.
- The carbon atom nearer to the eye is represented by a point.
- The rear carbon atom(the carbon atom away from the eye) is represented by a circle.
- The lines radiating from the center of the circle denotes the bonds of the carbon closest to us.

Newmann projections

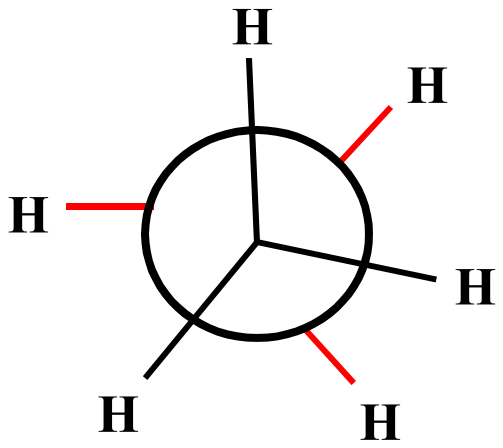
- Those lines radiating from the circumference (out side) denote the bonds of the carbon farthest form us.
- In staggered form distance between the H- Nuclei is $2.55A^0$.
- In eclipsed form distance between the H- Nuclei is $2.29A^0$.
- Dihedral angle in eclipsed form = 0^0.

Newmann projections

- Dihedral angle in staggered form = 180^0

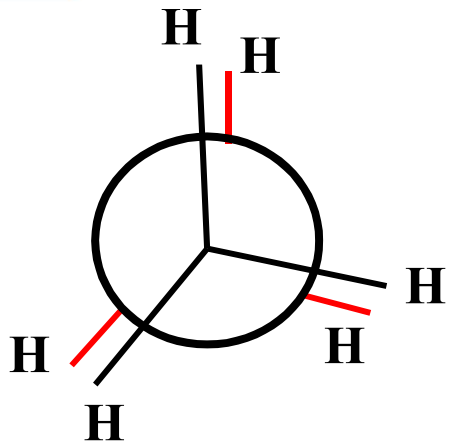


Newmann projections



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 :

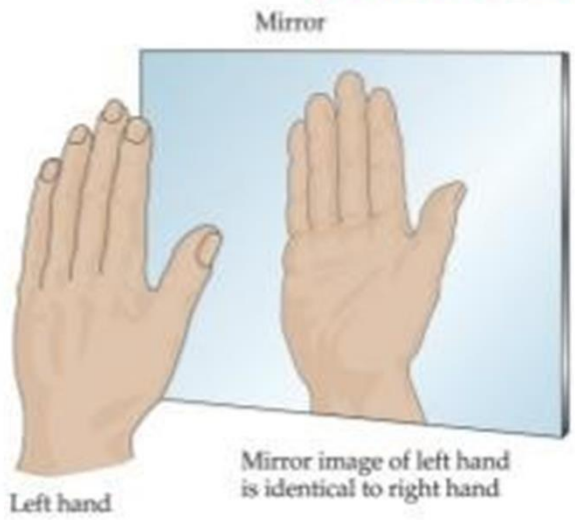
Optical Isomers:

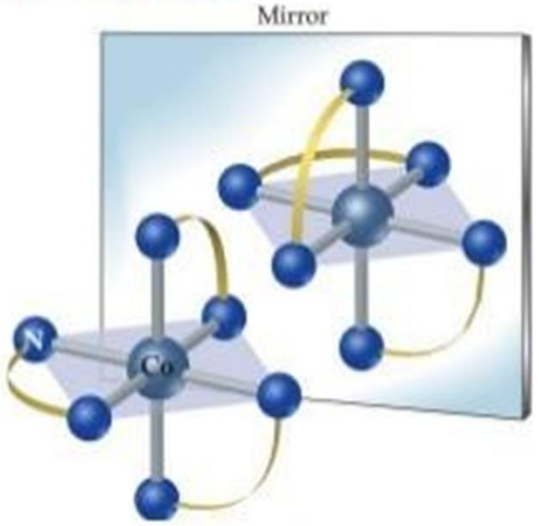
The isomers that rotate plane polarised light are called *optical isomers*

- **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

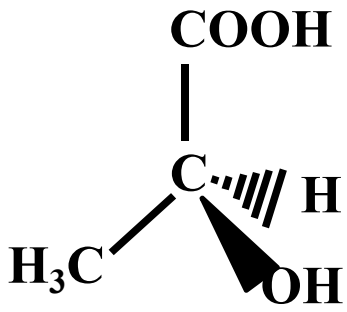




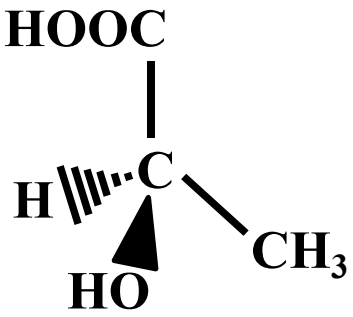
Enantiomers

- **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

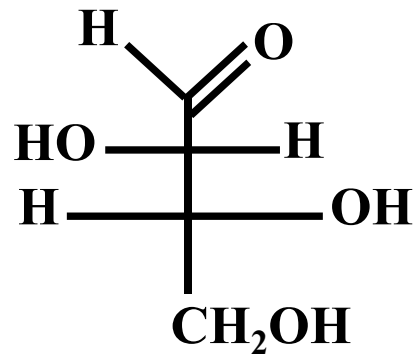


(S)-(–)-lactic acid

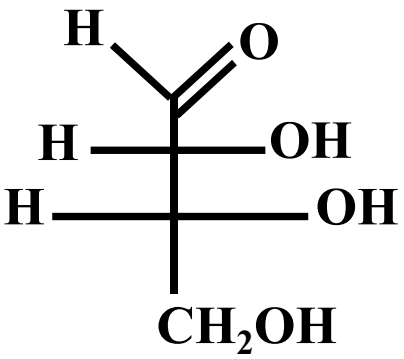
Diastereomers

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

e.g:



D- Threose



D- Erythrose

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

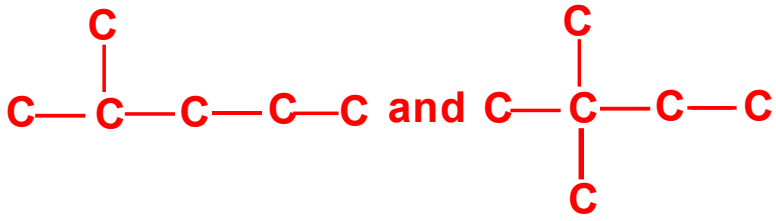
2) Geometrical isomers

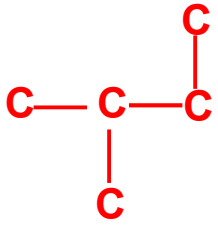
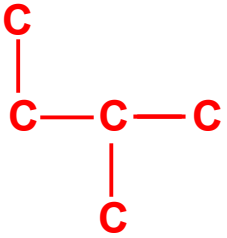
3) Chain isomers

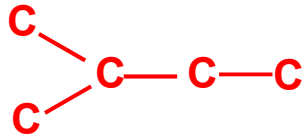
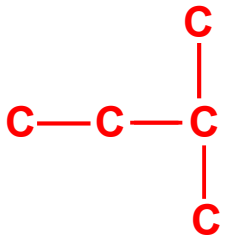
4) Functional isomers

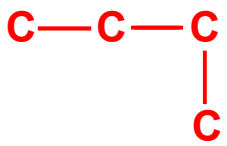
OBJECTIVE QUESTIONS
LEVEL-II

1) Which is the example of branch isomerization

1)  and

2)  and 

3)  and 

4)  and 

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?

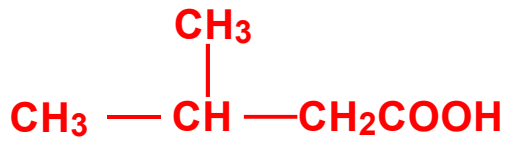
1) CH_3-CH_2-COOH

2) CH_3-CHOH-COOH ✓

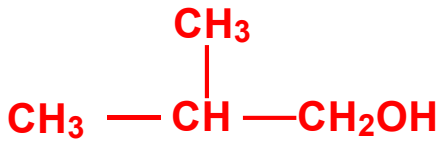
3) HOOC-CH_2-COOH

4) CH_3-CO-COOH

4) Which of the following has Chiral centre

1) 

2) 

3) 

✓ 4) 

5) Which one of the following pairs is an example of position isomerism

1) $CH_3—CH_2—CH_2—CH_3$ and $CH_3—\underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}}—CH_2$

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) $CH_3—\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{\displaystyle |}{\underset{\displaystyle |}{C}}}}—CH_3$ and $CH_3—CH_2—CH_2—CH_2—CH_3$

6) Goemetrical isomerism is shown by

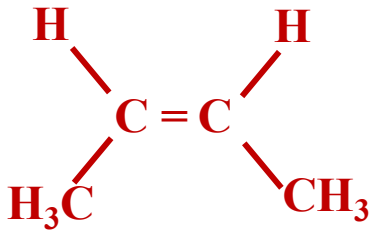
1) 2 – butene

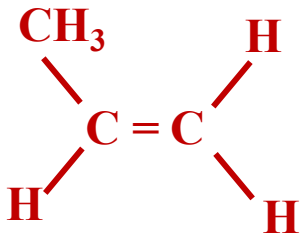
2) 2 – butyne

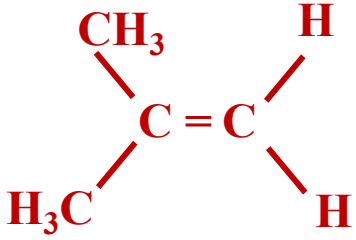
3) 2 – butanol

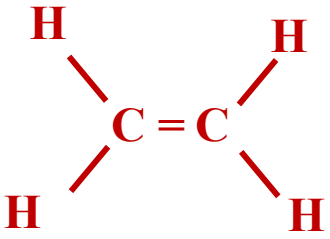
4) Butanol

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?

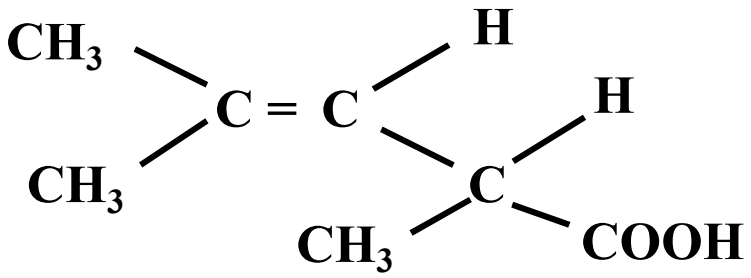
1) Geometrical isomerism, Position isomerism

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

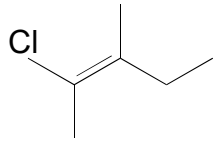
8) Which of the following is the most stable form of cyclohexane?

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

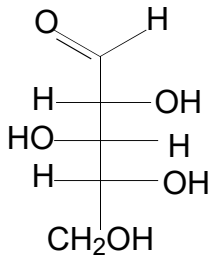
1) 0

2) 1

3) 3

4) 4 ✔

12) What is the R and S configuration for each sterogenic centre in this form top to bottom?



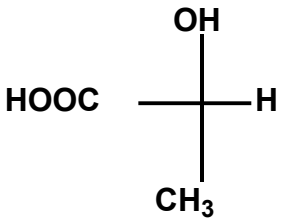
1) R.R.R

2) R.S.S

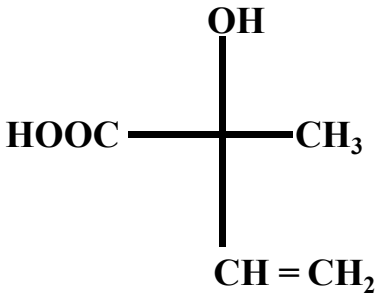
3) R.S.R ✓

4) S.S.R

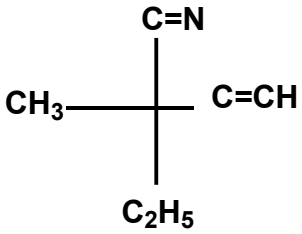
13) The following compounds A, B, C have R or S configuration



(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}

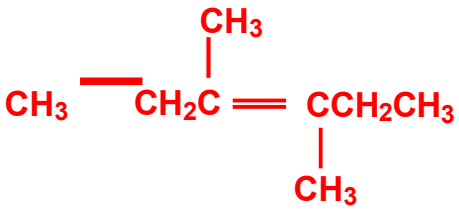
1) 3

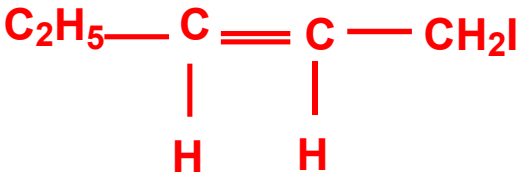
2) 6

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

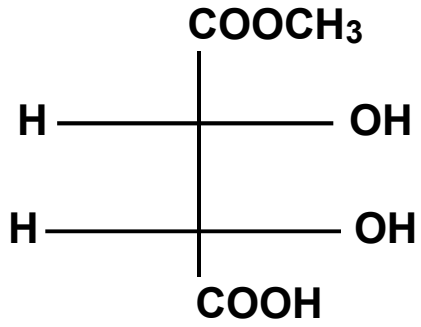
1) 16

2) 8

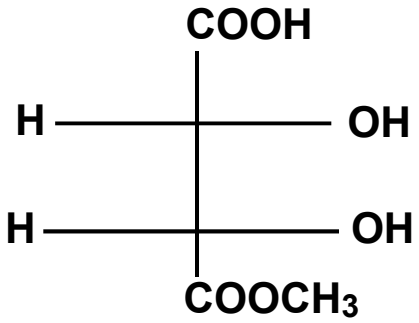
3) 4

4) 2

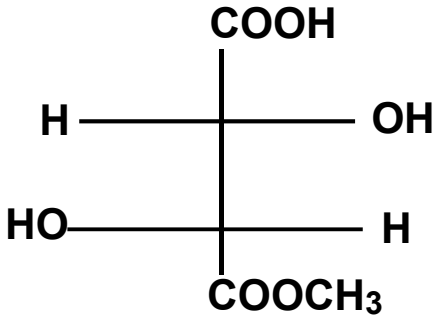
18) The following compounds A,B,C have R or S configuration



(A)



(B)



(C)

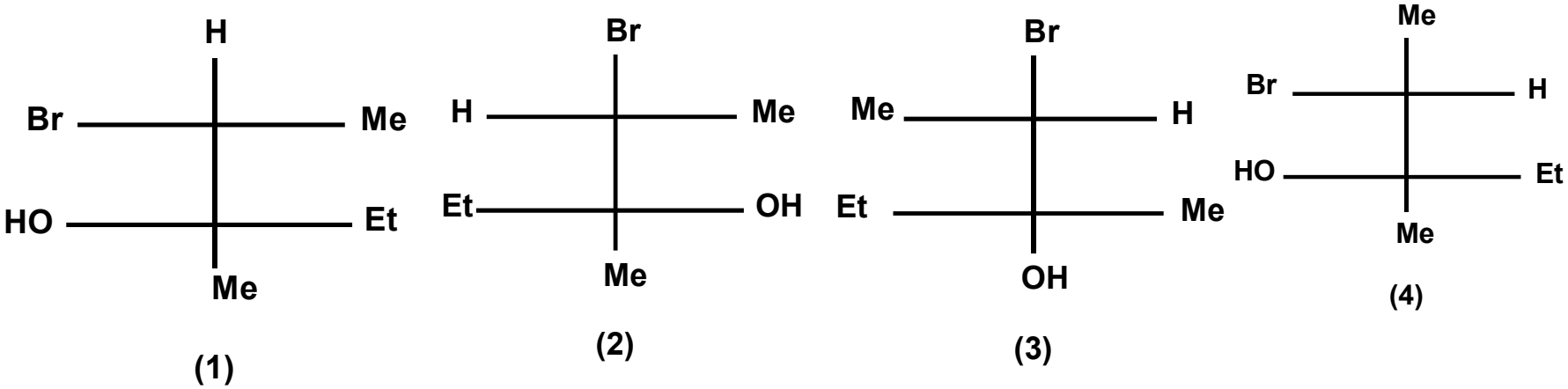
1) A and B are identical

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 superimposable?



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) $CH_3CHCl\text{-}CH_2\text{-}CH_3$

2) $CH_3\text{-}CH_2\text{-}CHCl\text{-}CH_2\text{-}CH_3$

3) $ClCH_2\text{-}CH_2\text{-}CH_3$

4) $ClCH_2\text{-}CH_2\text{-}CH_3$

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

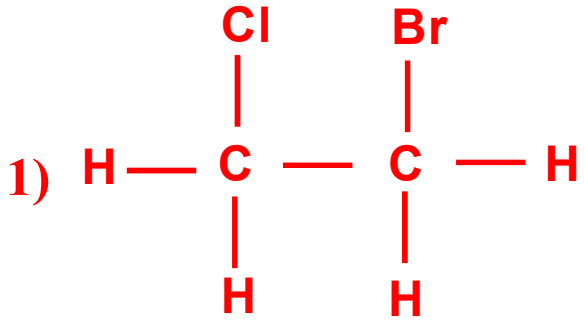
2) 2

3) 3

4) 4

42) Which one of the following contains asymmetric carbon atom

1)



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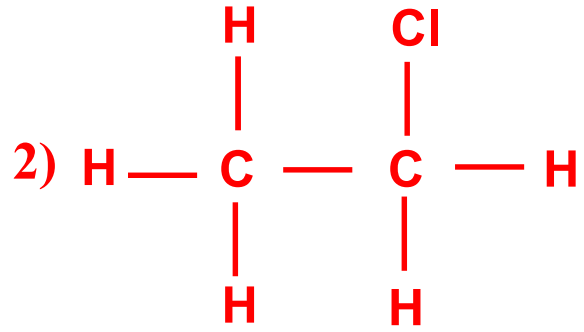
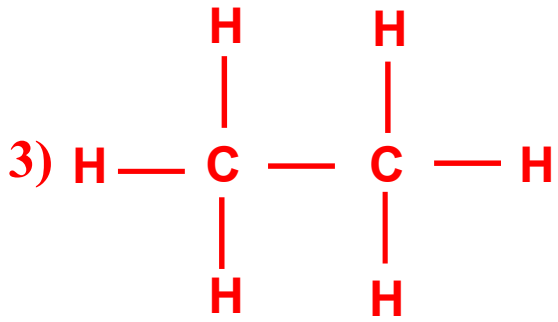
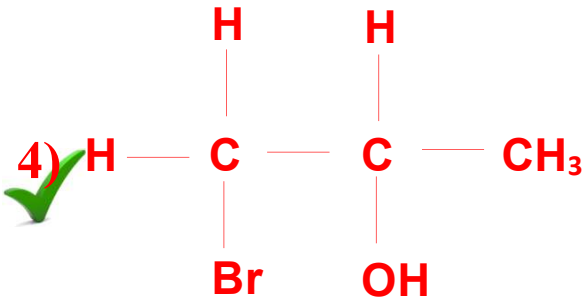


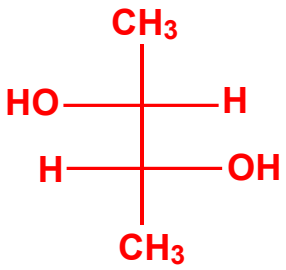
3)



4) ✓



43) Which one of the following compounds are enantiomers

1) 

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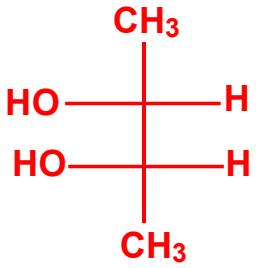
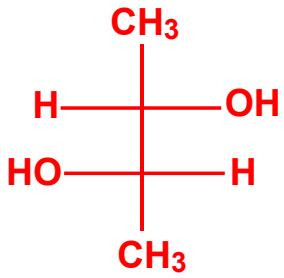
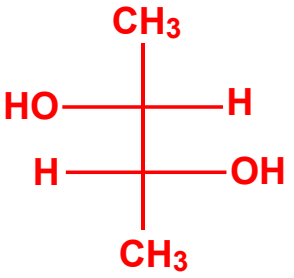
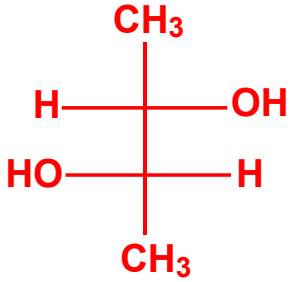


2) 

and


3) 

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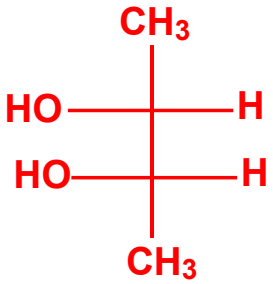
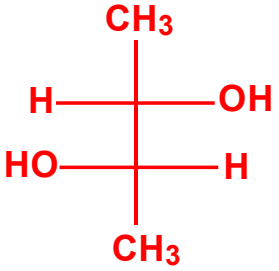


4) 

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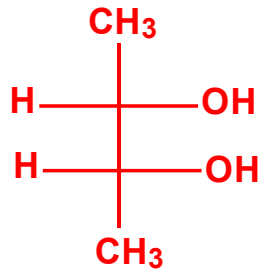


PREVIOUS COMPETITIVE QUESTIONS

1) **Which one of the following acids does not exhibit optical isomerism?** (J.M.O.L– 2014)

1) Lactic Acid

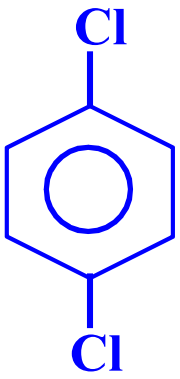
2) Tataric Acid

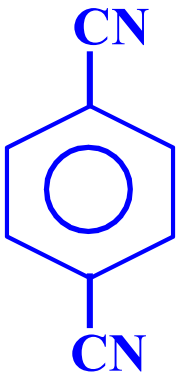
3) Maleic Acid

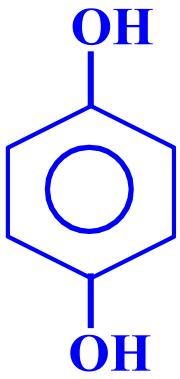
4) α-Amino Acids

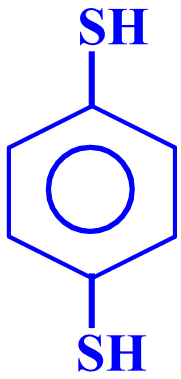
2) For which of the following molecule significant $\mu \neq 0$?

(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)

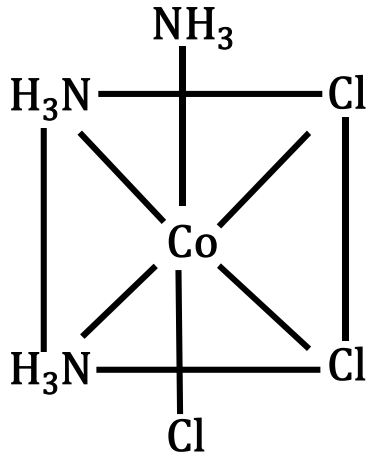
1) $[Co(en)_2Cl_2]^+$

2) $[Co(NH_3)_3Cl_3]$

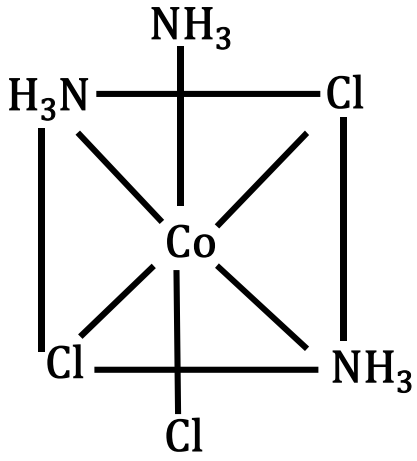
3) $[Co(en)(NH_3)_3Cl_2]^+$

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, Vinylalcohol	(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-CH(OH)-CH(OH)-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) $CH_3CH_2CH_2OH$, $CH_3CH(OH)CH_3$

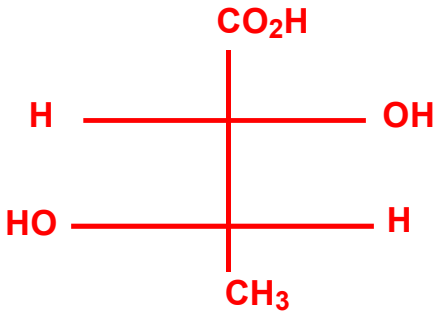
2) $CH_3CH_2CH_2CH_2OH$, $(CH_3)_2CHCH_2OH$

3) $CH_3CH_2CH_2OH$, $CH_3CH_2CH_2Cl$

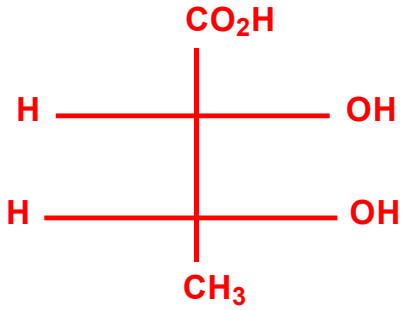
4) $CH_3CH_2CH_2OH$, $CH_3\text{-}O\text{-}CH_2CH_3$

13) The correct Fischer projection formula of (2R, 3R) – 2, 3 –dihydroxy butanoic acid is

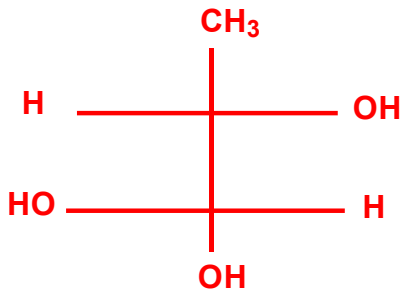
1)



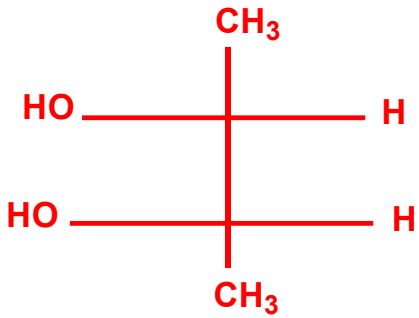
2)



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)

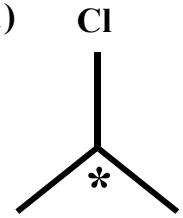
1) 2-Chlorobutane

2) 2-Chloropropanal

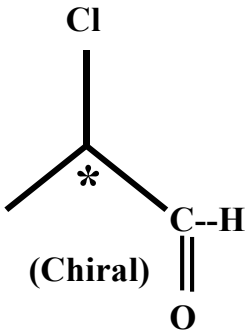
3) 2-Chloro -2-methylbutane

4) 2-Chloropeptane

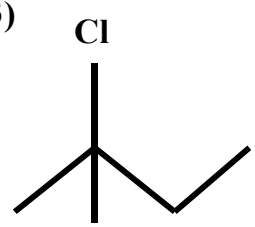
Solution :

(1) 

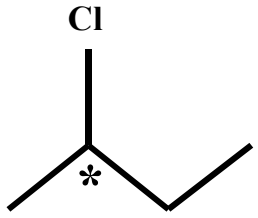
(Chiral)

(2) 

(Chiral)

(3) 

(Achiral)

(4) 

(Chiral)

KEY : 3

16) Which of the following pairs of compounds are positional isomers

(J.M.O.L. – 2015)

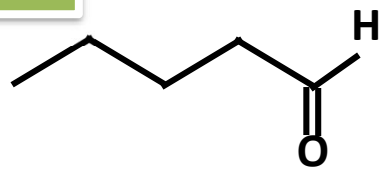
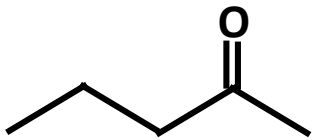
1) $CH_3-CH_2-CH_2-CH_2-CHO$ and $CH_3-CH_2-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$

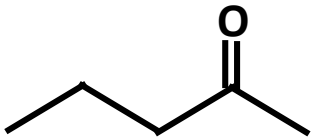
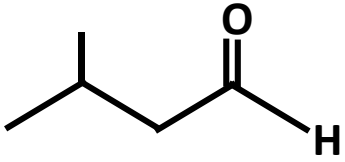
2) $CH_3-CH_2-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$ and $CH_3-\underset{\underset{CH_3}{|}}{CH}-CH_2-CHO$

3) $CH_3-CH_2-CH_2-\overset{\overset{O}{\|}}{C}-CH_3$ and $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-CH_2-CH_3$

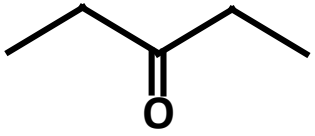
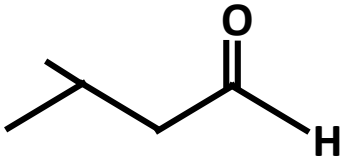
4) $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-CH_2-CH_3$ and $\begin{matrix} CH_3 \\ \diagdown \\ CH-CH_2-CHO \\ \diagup \\ CH_3 \end{matrix}$

Solution :

1)  and  are functional isomers

2)  and  are functional isomers

3) $CH_3\text{-}CH_2\text{-}\overset{\overset{O}{\|}}{C}\text{-}CH_2\text{-}CH_3$ and $CH_3\text{-}\overset{\overset{O}{\|}}{C}\text{-}CH_2\text{-}CH_2\text{-}CH_3$ 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

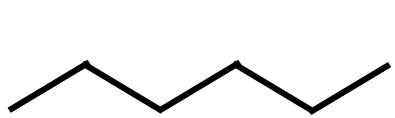
2) 4

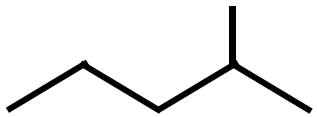
3) 5

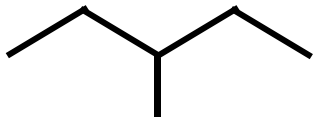
4) 6

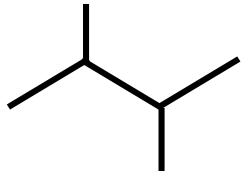
Solution :

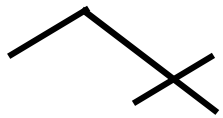
C_6H_{14} isomers are





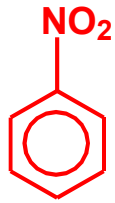




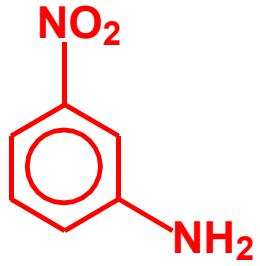


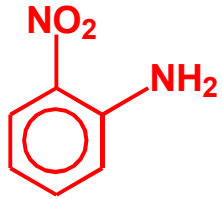
KEY : 3

18) Which compound exhibits maximum dipole moment among the following? (J.M.O.L. – 2015)

1) 

2) 

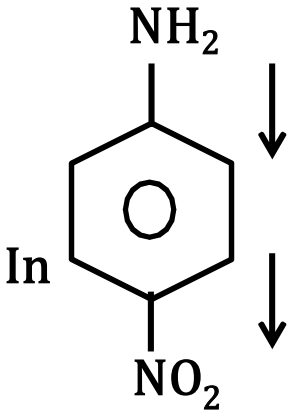
3) 

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)

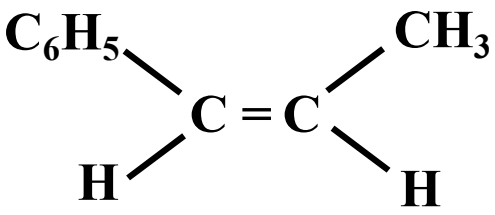
1) 1-Phenyl-2-butene

2) 3Phenyl-1-butene

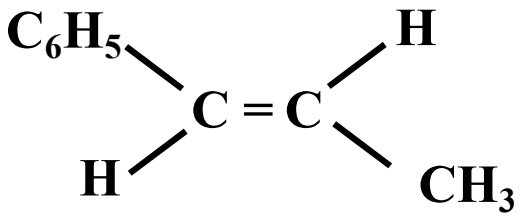
3) 2-Phenyl-1-butene

4) 1,1-Diphenyl-1-propane

Solution :



Cis



Trans