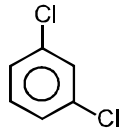
Exercise-1

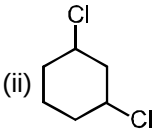
Marked questions are recommended for Revision.

PART - I : SUBJECTIVE QUESTIONS

Section (A) : Geometrical isomerism

A-1. Which of the following compounds have restricted rotation and out of which can show geometrical isomerism?

(i) 

(ii) 

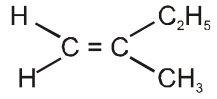
(iii) ClCH=CHCl (iv) Ph–N=N–Ph

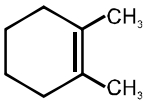
(v) $CH_3CH=C(CH_3)_2$ (vi) $CH_3CH = CH_2$ (vii) $CH_3CH=CHCH_3$ (viii) $CH_3–C\equiv C–CH_3$

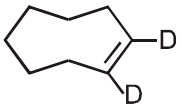
A-2. Write the essential conditions for geometrical isomerism.

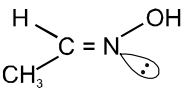
A-3. Define restricted rotation and give one example each of acyclic and cyclic compound, which can show geometrical isomersm.

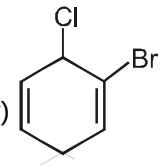
A-4. Which of the following can show geometrical isomerism.

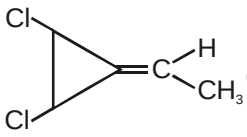
(i) 

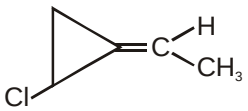
(ii) 

(iii) 

(iv) 

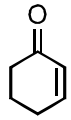
(v) 

(vi) 

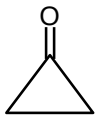
(vii) 

(viii) $CH_2=CH–CH=CH–Ph$

A-5. Which of the following carbonyl compound will give two products after reaction with NH_2OH :

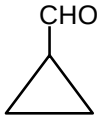
(i) 

(ii) $CH_3–CHO$

(iii) 

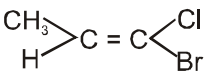
(iv) DCHO

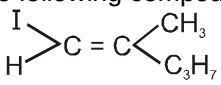
(v) 

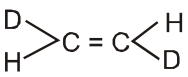
(vi) 

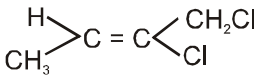
Section (B) : CIP Rules (E/Z Naming) & Physical Properties of G.I

B-1. Indicate whether each of the following compound is 'E' or 'Z'.

(i) 

(ii) 

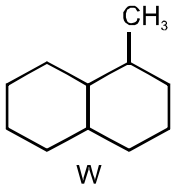
(iii) 

(iv) 

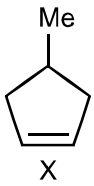
B-2. **(a)** BrHC=CHBr exists as two diastereomers draw them and compare their dipole moment.
(b) trans-Butenedioic acid has higher melting point than cis-butenedioic acid. Why ?
(c) Draw the cis and trans structures of hex-2-ene. Which isomer will have higher b.p. and why ?

Section (C) : Chiral carbon and Projection Formula

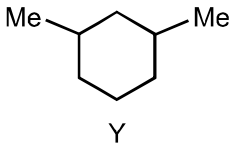
C-1. Number of chiral carbon atoms in the compound W, X, Y and Z respectively would be :



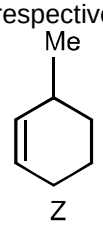
W



X



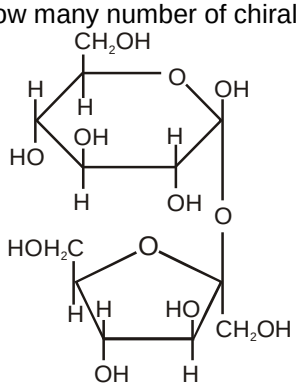
Y



Z

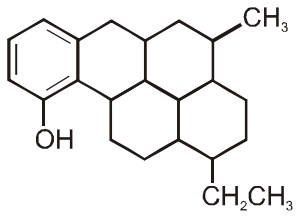
C-2. How many number of chiral centres present in the following compounds ?

(i)



D(+)-Sucrose

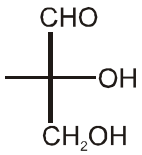
(ii)



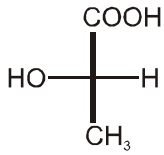
Section (D) : R/S & D/L Naming.

D-1. Find R/S configuration of following compounds.

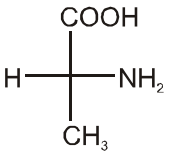
(I)



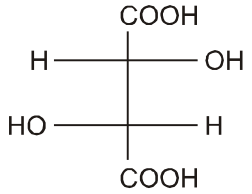
(II)



(III)

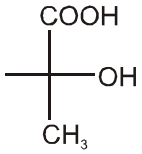


(IV)

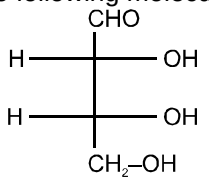


D-2. Find D/L configuration in the following molecules.

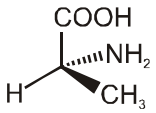
(I)



(II)

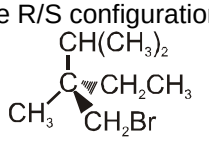


(III)

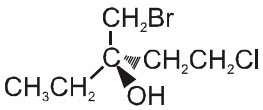


D-3. The R/S configuration of following compounds are :

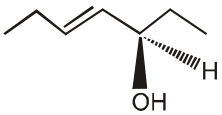
(a)



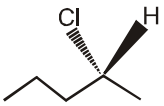
(b)



(c)



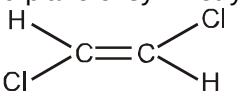
(d)



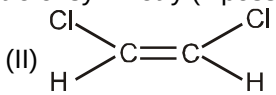
Section (E) : Element of Symmetries (POS, COS, AOS)

E-1. Find plane of symmetry and centre of symmetry (if possible) in the following compounds.

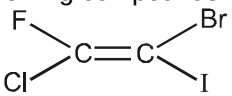
(I)



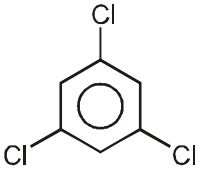
(II)



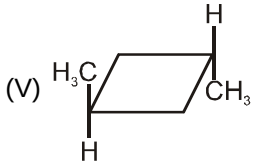
(III)



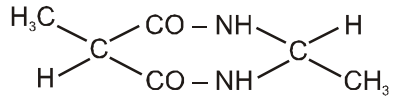
(IV)

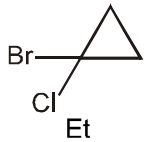


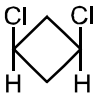
(V)



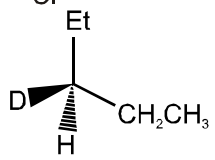
E-2. Find plane of symmerty, centre of symmerty and axis of symmetry (if possible) in the following molecules.

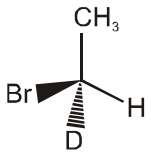
(i) 

(ii) 

(iii) 

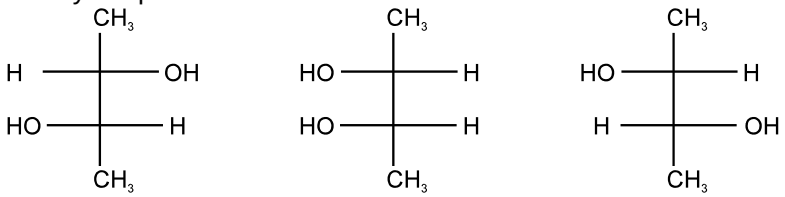
(iv) 

(v) 

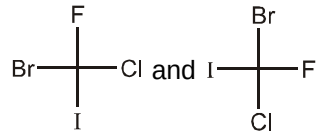
(vi) 

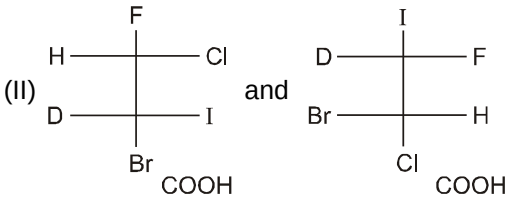
Section (F) : Definition and Properties of Enantiomers, Diastereomers, Mesocompounds

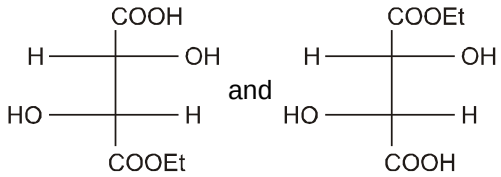
F-1. Identify the pairs of enantiomers and diastereomers from the following compounds I, II and III :

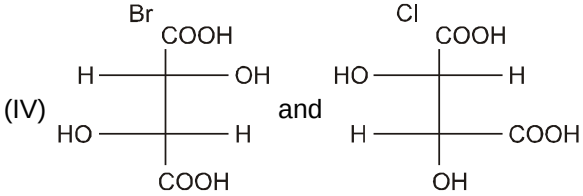


F-2. Find relationship between the given pairs.

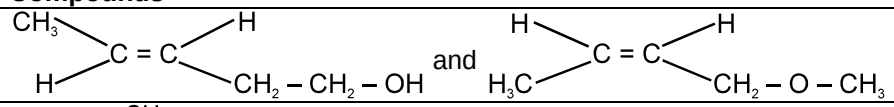
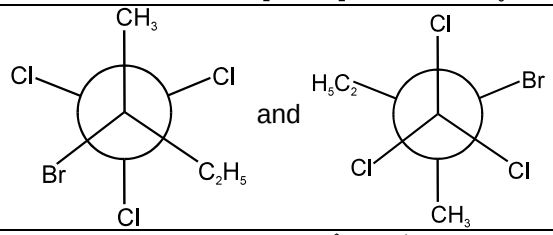
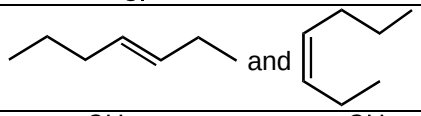
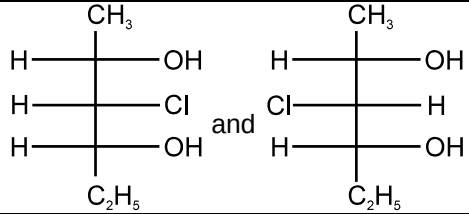
(I) 

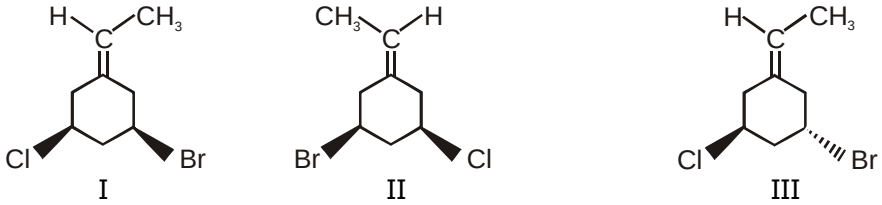
(II) 

(III) 

(IV) 

F-3. Give the relationship between the following pairs of compounds.

	Compounds	**Relationship**
(a)		.....
(b)		.....
(c)		.....
(d)		.....

F-4. 

(i) Total number of fractions on fractional distillation of I, II and III. (ii) Optical active compounds.
(iii) Relation between I and II. (iv) Relation between I and III.

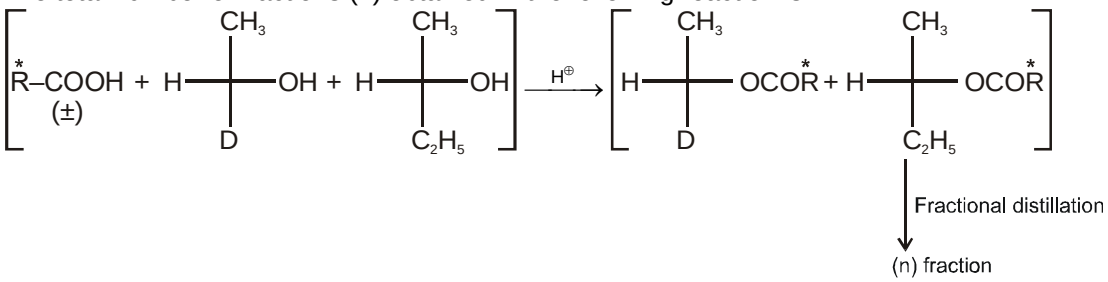
Section (G): Specific rotation, optical purity, enantiomeric excess and Optical Resolution

G-1. What does D/L & d/□ represent.

G-2. Write the definition of specific rotation.

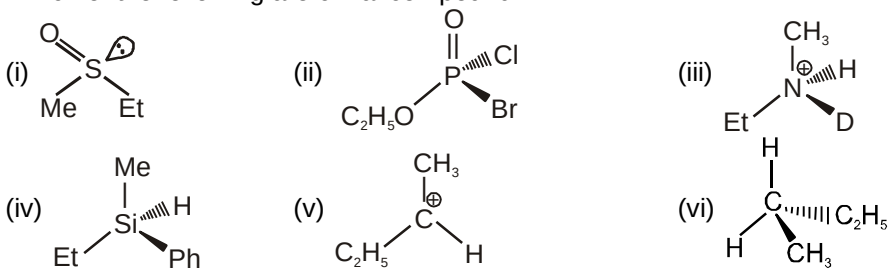
G-3. Write the formula for optical purity & enantiomeric excess.

G-4. The total number of fractions (n) obtained in the following reaction is .....



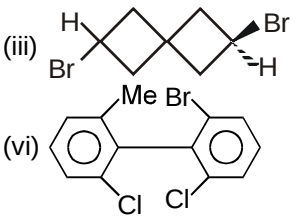
Section (H) : Optical active compounds without chiral carbon and Amine inversion

H-1. Which of the following are chiral compound.



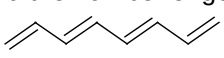
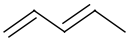
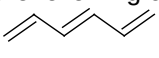
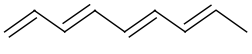
H-2. Which of the following are chiral molecules

(i) Ph–CH=C=C=CH–Cl (ii) CH_3–CH=C=C=C=CH–CH_3



Section (I) : Calculation of no. of Stereoisomers

I-1. Find the number of geometrical isomers possible of the following compounds.

(i)  (ii)  (iii)  (iv) 

I-2. How many n-octene can show geometrical isomerism ?

I-3. How many geometrical isomers are possible for Hepta-2, 5-dienoic acid :

I-4. For the given compound $CH_3-\underset{\underset{OH}{|}}{CH}-CH=CH-CH_3$.

(I) Total number of stereoisomers.
(II) Number of optically active stereoisomers.
(III)Total number of fractions on fractional distillation of all stereoisomers.

I-5. The total number of possible isomers with molecular formula C_6H_{12} that contain a cyclobutane ring.

I-6. The number of isomers for the compound with molecular formula $C_2BrClFI$ are :

Section (J) : Conformational Isomerism

J-1. Which conformational state of n-butane lies in higher energy state when rotated along C_2–C_3 bond?

J-2. Draw the most stable conformation of meso-CH_3CHD–$CHDCH_3$

J-3. Write the most polar and most stable conformer of 1-nitropropane.

J-4. Draw the most stable conformer of 3-hydroxypropanal.

J-5. Write the Newman projection formula of the following compounds
(I) Cl–CH_2–CH_2–CH_3 in its most polar form.
(II) HO–CH_2–CH_2–OH in its most stable form.
(III) HOOC–CH_2–CH_2–COOH in its least stable staggered form.

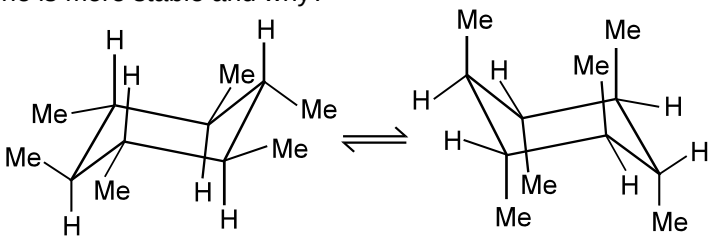
J-6. Draw the most stable Newman projection formula along C_1–C_2 bonds of following compounds.

(i) $\overset{1}{C}H_3-\overset{2}{C}H_2-CH_3$ (ii) $\overset{1}{C}H_3-\overset{2}{C}H(CH_3)-CH_3$ (iii) $CH_3-\underset{1}{CH}(CH_3)-\underset{2}{CH}(CH_3)-CH_3$ (iv) $HO-\overset{1}{C}H_2-\overset{2}{C}H_2-F$

Section (K) : Cyclohexane

K-1. Which of the following combination of axial & equitorial bonds show Cis or Trans orientation in Dimethyl cyclohexane.
(i) 1e, 2e (ii) 1e, 3e (iii) 1e, 4e (iv) 1e, 2a (v) 1e, 3a (vi) 1e, 4a (vii) 1a, 3a

K-2. Which one is more stable and why?



(I) (II)

PART - II : ONLY ONE OPTION CORRECT TYPE

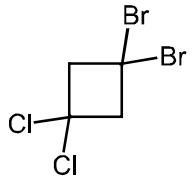
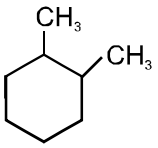
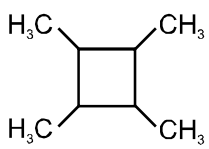
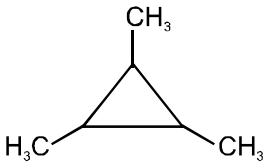
Section (A) : Geometrical isomerism

A-1. Stereoisomers have different : .
(A) Molecular formula (B) Structural formula
(C) Configuration (D) Molecular mass

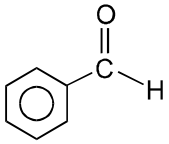
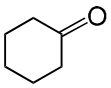
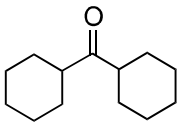
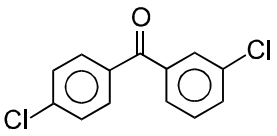
A-2. Which can show the cis-trans isomerism :
(A) $ClCH_2CH_2Cl$ (B) $Cl_2C=CH_2$ (C) $Cl_2C=CCl_2$ (D) ClCH=CHCl

A-3. Which of the following compounds will not show geometrical isomerism :
(A) Azomethane (B) 1-Bromo-2-chloroethene
(C) 1-Phenylpropene (D) 2-Methyl-2-butene

A-4. Which of the following compound can not show geometrical isomerism ?

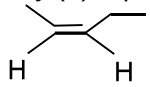
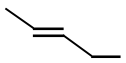
(A) 
(B) 
(C) 
(D) 

A-5.* Which of the following will form only one oxime on reaction with NH_2OH solution ?

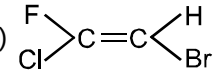
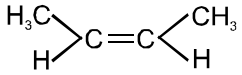
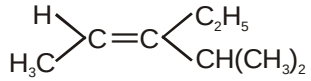
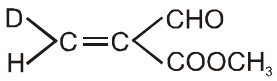
(A) 
(B) 
(C) 
(D) 

Section (B) : CIP Rules (E/Z Naming) & Physical Properties of G.I

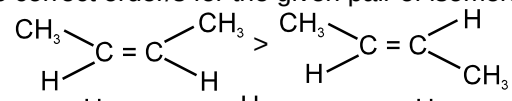
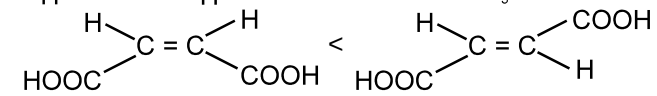
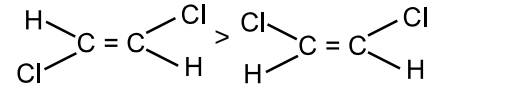
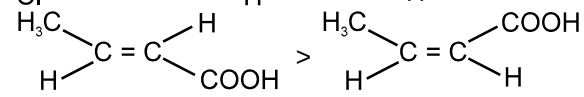
B-1. Identify (Z)-2-pentene :

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

B-2. The 'E'-isomer is/are :

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

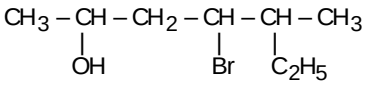
B-3. The correct order/s for the given pair of isomers is

(A)  (Melting point)
(B)  (Dipole moment)
(C)  (Boiling point)
(D)  (Water solubility)

Section (C) : Chiral carbon and Projection Formula

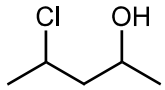
C-1. Chiral molecules are :
(A) Superimposable on their mirror image
(B) Not superimposable on their mirror image
(C) unstable molecules
(D) capable of showing geometrical isomerism

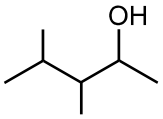
C-2. Number of chiral carbon persent in the following compound :

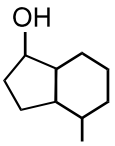


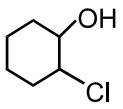
(A) 2 (B) 3 (C) 4 (D) 5

C-3. The compound which has maximum number of chiral centres is

(A) 

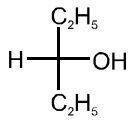
(B) 

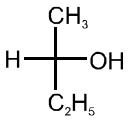
(C) 

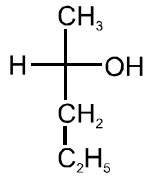
(D) 

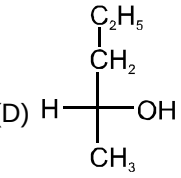
Section (D) : R/S & D/L Naming.

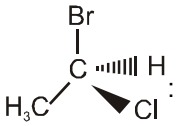
D-1. Which of the following is the structure of (S)-Pentan-2-ol is ?

(A) 

(B) 

(C) 

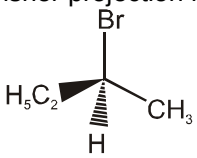
(D) 

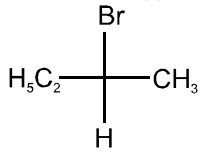
D-2. The configuration of the given compound is 

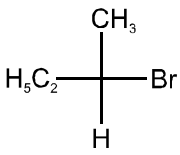
:

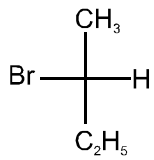
(A) E (B) R (C) S (D) Z

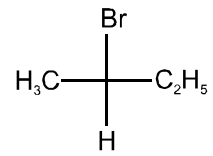
D-3. Which Fisher projection represents the given wedge dash structure :



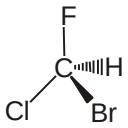
(A) 

(B) 

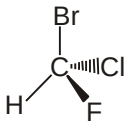
(C) 

(D) 

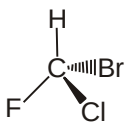
D-4. Which of the following have same configuration.



I



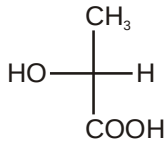
II

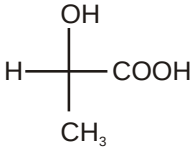


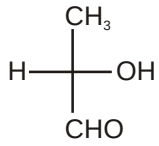
III

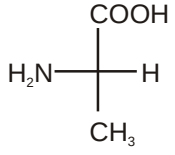
(A) I & II (B) II & III (C) I & III (D) All

D-5. Which has D configuration.

(A) 

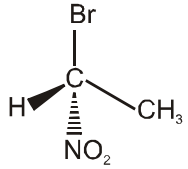
(B) 

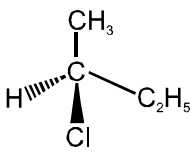
(C) 

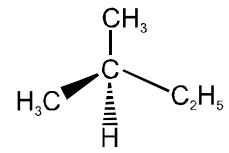
(D) 

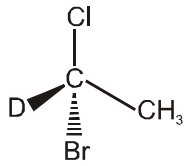
Section (E) : Element of Symmetries (POS, COS, AOS)

E-1. Which of the following compound posses plane of symmetry?

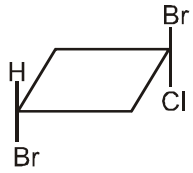
(A) 

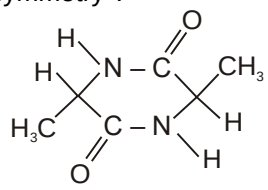
(B) 

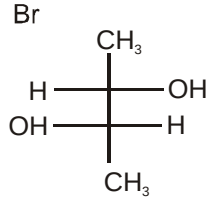
(C) 

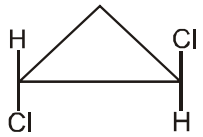
(D) 

E-2. Which of the following compound posses centre of symmetry ?

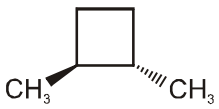
(A) 

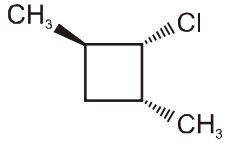
(B) 

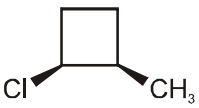
(C) 

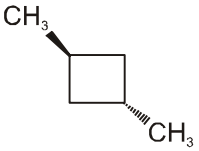
(D) 

E-3. Which of the following are chiral :

(1) 

(2) 

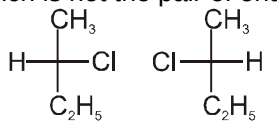
(3) 

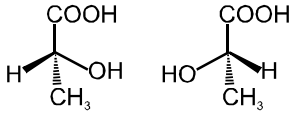
(4) 

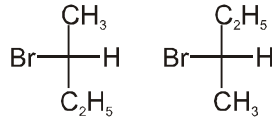
(A) 1, 2, 3 (B) 1, 2, 4 (C) 2, 3, 4 (D) 1, 3, 4

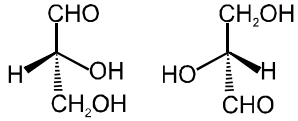
Section (F) : Definition and Properties of Enantiomers, Diastereomers, Meso compounds

F-1. Which is not the pair of enantiomers ?

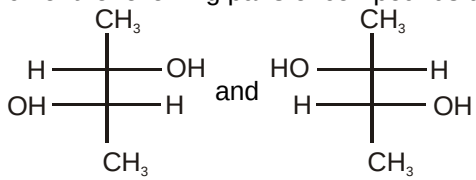
(A) 

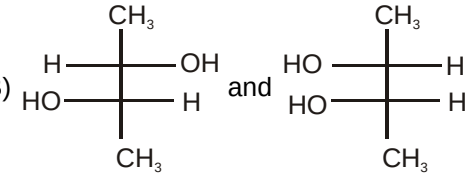
(B) 

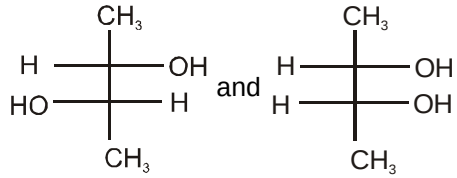
(C) 

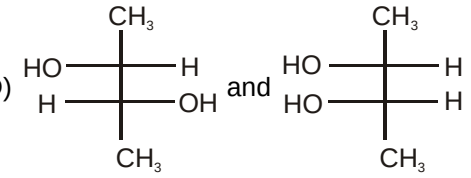
(D) 

F-2. Which of the following pairs of compounds are enantiomers :

(A) 

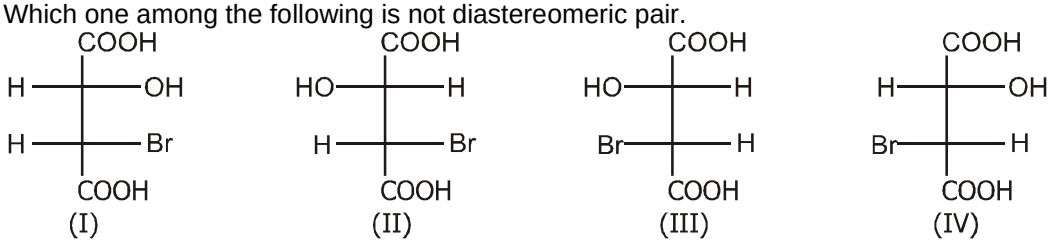
(B) 

(C) 

(D) 

F-3. Stereoisomers which are not mirror image of each other, are called :
(A) Enantiomers (B) Tautomers (C) Meso (D) Diastereomers

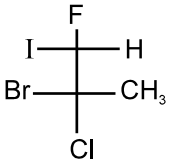
F-4. Which one among the following is not diastereomeric pair.

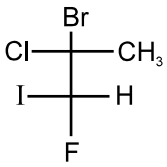


(I) (II) (III) (IV)

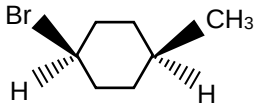
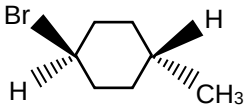
(A) I and III (B) I and II (C) II and III (D) I and IV

F-5. What is the relationship between (I) & (II)


(I)


(II)

(A) Enantiomer (B) Diastereomers
(C) Constitutional isomer (D) Identical molecules

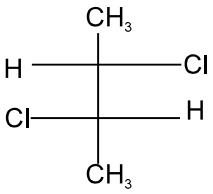
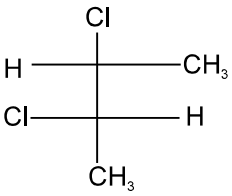
F-6.  and  are :

(A) Enantiomers (B) Optical inactive diastereomers
(C) Optical active diastereomers (D) Identical

Section (G) : Specific rotation, optical purity, enantiomeric excess and Optical Resolution

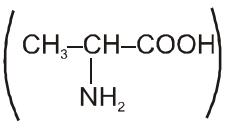
G-1. The instrument which can be used to measure optical activity, i.e., specific rotation:
(A) Refractometer (B) Photometer (C) Voltmeter (D) Polarimeter

G-2. (+) tartaric acid has a specific rotation of +12 unit when measured in 12 cm polarimeter tube and 2g/ml concentration at given temperature and light. When it is diluted to half the concentration, length of tube and other parameters being same, then the specific rotation will be :
(A) +6 unit (B) +12 unit (C) –6 unit (D) +24 unit

G-3. If optical rotation produced by  is +36º then that produced by  is :

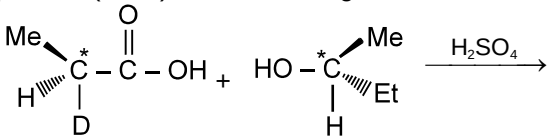
(A) –36º (B) 0º (C) +36º (D) unpredictable

G-4. The enantiomeric excess and observed rotation of a mixture containing 6 gm of (+)-2-butanol and 4 gm of (–)-2-butanol are respectively (If the specific rotation of enantiomerically pure (+)-2-butanol is + 13.5 unit).
(A) 80%, + 2.7 unit (B) 20%, – 27 unit (C) 20%, + 2.7 unit (D) 80%, – 27 unit

G-5. The racemic mixture of Alanine  can be resolved by using,

(1) (+)-2-Butanol (2) (□)-2-Chlorobutanoic acid
(3) (±) -2-Butanol (4) (d□ mix)-2-Chlorobutanoic acid
(A) 1 & 2 only (B) 1 & 3 only (C) 2 & 4 only (D) 3 & 4 only

G-6. The major product (ester) of the following reaction is



(A) A single stereoisomer (optically active)
(B) A mixture of diastereomers (both optically active)
(C) A racemic mixture (optically inactive)
(D) A mixture of four stereoisomers (two racemic mixtures)

G-7. Which of the following pair of isomers can not be separated by fractional crystallisation or fractional distillation:

(A) Maleic acid and Fumaric acid

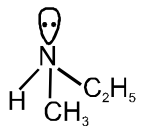
(B) (+)-Tartaric acid and meso-tartaric acid

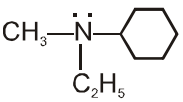
(C) $CH_3-\underset{\underset{NH_2}{|}}{CH}-COOH$ and $H_2N-CH_2-CH_2-COOH$

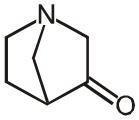
(D) (+)-lactic acid and (–)-lactic acid

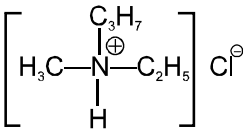
Section (H) : Optical active compounds without chiral carbon and Amine inversion

H-1*. Which of the following compounds will show optical activity ?

(A) 

(B) 

(C) 

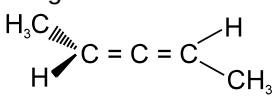
(D) 

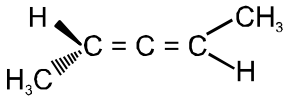
H-2. Which of the following amine is optically active?

(A) CH_3NH_2 (B) $CH_3NHC_2H_5$

(C) $CH_3CH_2CH_2-N(CH_3)(C_2H_5)$ (D) sec-Butylamine

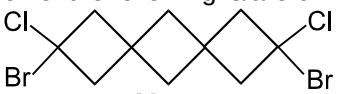
H-3. The following molecules are :

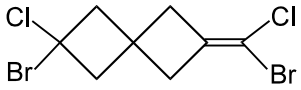


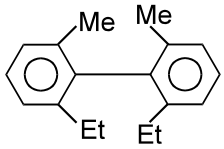


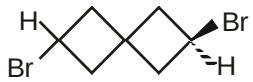
(A) Enantiomers (B) Diastereomers (C) Identical (D) Conformers

H-4.* Which of the following is/are chiral ?

(A) 

(B) 

(C) 

(D) 

Section (I) : Calculation of no. of Stereoisomers

I-1. How many geometrical isomers are possible for the given compound?

$Ph-CH=CH-CH=CH-COOH$

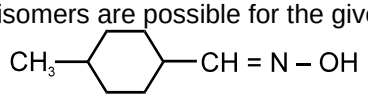
(A) 2 (B) 4 (C) 6 (D) 8

I-2. How many geometrical isomers are possible for the given compound?

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

(A) 2 (B) 3 (C) 4 (D) 8

I-3. How many geometrical isomers are possible for the given compound?



(A) 2 (B) 4 (C) 6 (D) 8

I-4. Total number of stereoisomers of compound is :

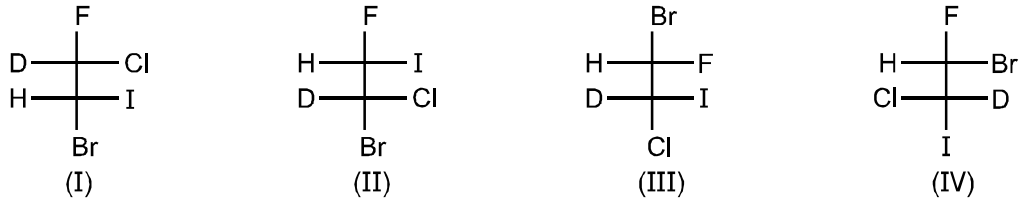
$CH_3-\underset{\underset{OH}{|}}{CH}-\underset{\underset{Br}{|}}{CH}-CH_3$

(A) 2 (B) 4 (C) 6 (D) 8

I-5. Total number of optically active stereoisomers of tartaric acid is

(A) 2 (B) 4 (C) 3 (D) 0

I-6. Number of fractions on fractional distillation of mixture of :



(A) 2 (B) 3 (C) 4 (D) 1

I-7. Total number of optically active stereoisomers of $CH_3-\underset{\underset{Cl}{|}}{CH}-\underset{\underset{Cl}{|}}{CH}-\underset{\underset{Cl}{|}}{CH}-CH_3$

(A) 2 (B) 4 (C) 6 (D) 8

I-8. The total number of ketones (including stereo isomers) with the molecular formula $C_6H_{12}O$ is :
(A) 4 (B) 5 (C) 6 (D) 7

I-9. Total number of optical active stereoisomers of the following compound is :
$CH_3–CH=CH–CHCl–CH=C=CH–CH=CH–CH_3$
(A) 8 (B) 6 (C) 16 (D) 10

Section (J) : Conformational Isomerism

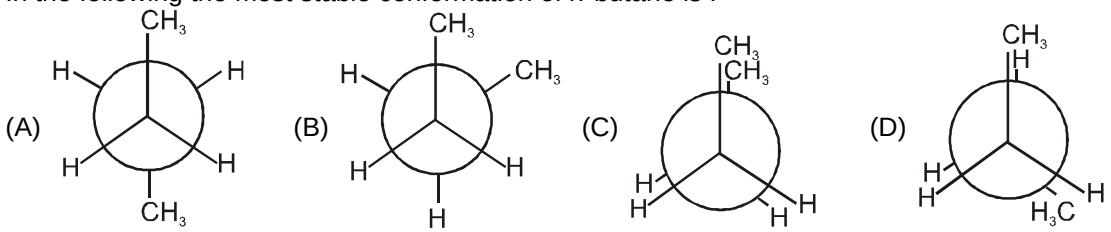
J-1. The eclipsed and staggered conformation of ethane is due to –
(A) Free rotation about C–C single bond (B) Restricted rotation about C–C single bond
(C) Absence of rotation about C–C bond (D) None of the above

J-2. Which of the following is associated with Torsional strain ?
(A) Repulsion between bond pair of electrons (B) Size of the groups present at adjacent atoms
(C) Bond angle strain (D) Attraction of opposite charges

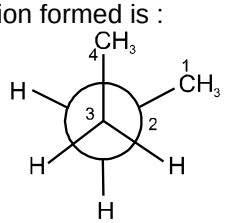
J-3. The Baeyer's angle strain is expected to be maximum in
(A) Cyclodecane (B) Cyclopentane (C) Cyclobutane (D) Cyclopropane

J-4. The minimum torsional strain developed in butane is at dihedral angle(s)
(A) 0º, 108º (B) 120°, 240º (C) 60°, 180°, 300° (D) 60°, 120°, 180°

J-5. In the following the most stable conformation of *n*-butane is :

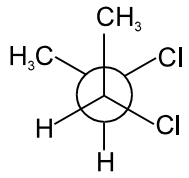


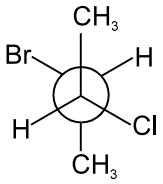
J-6. Newman projection of Butane is given, C-2 is rotated by 120º along $C_2–C_3$ bond in anticlockwise direction, the conformation formed is :

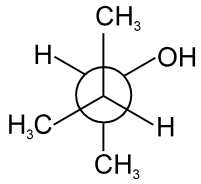


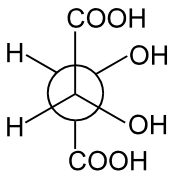
(A) anti (B) fully eclipsed (C) gauche (D) partially eclipsed

J-7. Which of the following is an achiral molecule?

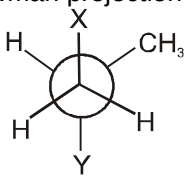
(A) 

(B) 

(C) 

(D) 

J-8. The newman projection formula of 2,3-dimethylbutane is given as



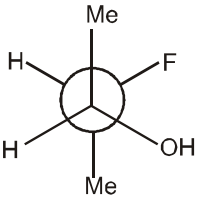
X,Y respectively can be :

(A) $-CH(CH_3)_2$ and H (B) $-CH_3$ and $-C_2H_5$ (C) $-C_2H_5$ and $-CH_3$ (D) H and $-CH(CH_3)_2$

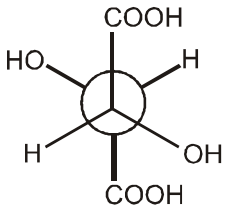
J-9. In 2-Fluoroethanol which conformer will be most stable ?

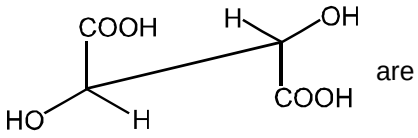
(A) Eclipsed (B) Skew (C) Gauche (D) Staggered

J-10. The true statement about the following corformation is :



(A) It has maximum angle strain.
(B) It does not have eclipsing strain (tortional strain).
(C) It does not have any intramolecular hydrogen bonding.
(D) It has maximum Vander Waal strain.

J-11. 

and 

are

(A) Enantiomers (B) diastereomers
(C) Identical compounds (D) Conformers

Section (K) : Cyclohexane

K-1. The least stable conformation of cyclohexane is

(A) Boat (B) Chair (C) Twist boat (D) Half chair

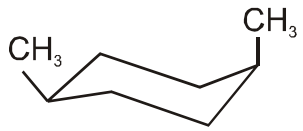
K-2. Flagpole interaction is present in :

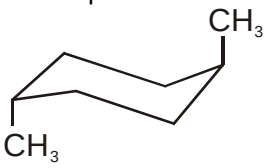
(A) Boat form of cyclohexane (B) Chair form of cyclohexane
(C) Anti form of n-butane (D) Fully eclipsed form of n-butane

K-3. Chair form of cyclohexane is more stable than boat form because:

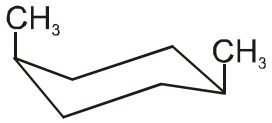
(A) In chair form carbons are in staggered form and in boat form carbons are in eclipsed form
(B) In chair form carbons are in eclipsed form and in boat form all the carbons are in staggered form
(C) Bond angle in chair form is 111° and bond angle in boat form is 109.5°
(D) Bond angle in chair form is 109.5° and in boat form 111°

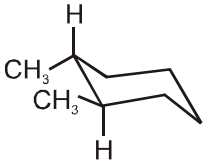
K-4. The most stable form of trans-1,4-dimethylcyclohexane is represented as :

(A) 

(B) 

(C) 

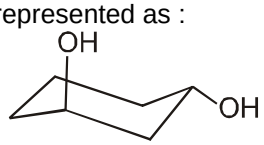
(D) 

K-5. Geometry of the given compound  is:

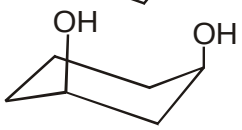
(A) Cis
(B) Trans
(C) Cis and trans both
(D) No geometrical isomerism

K-6. The most stable form of cis cyclohexane-1,3-diol is represented as :

(A) 

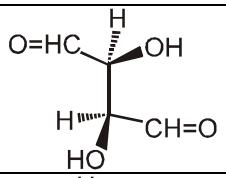
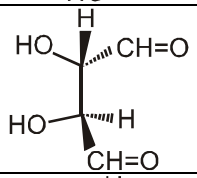
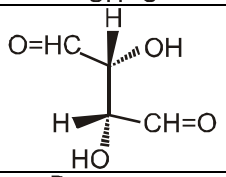
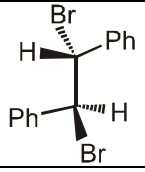
(B) 

(C) 

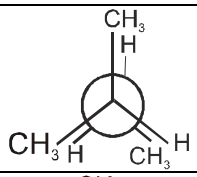
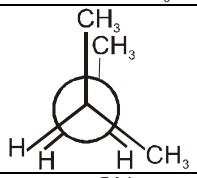
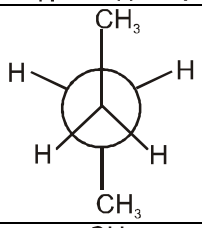
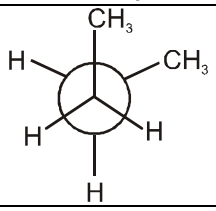
(D) 

PART - III : MATCH THE COLUMN

1. Match the column-I with column-II

	Column-I	**Column-II**	
(A)		(p)	Chiral Molecule
(B)		(q)	Achiral Molecule
(C)		(r)	Plane or centre of symmetry present
(D)		(s)	Axis of symmetry present (except C_1).

2. Match the following :

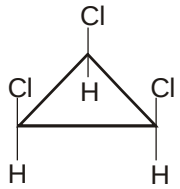
	Column-I		**Column-II**
(A)		(p)	Conformation with minimum vander-waal strain
(B)		(q)	Conformation with maximum vander waal strain
(C)		(r)	Conformation of maximum torsional strain
(D)		(s)	Conformation with minimum torsional strain

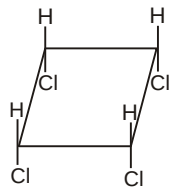
Exercise-2

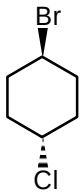
Marked questions are recommended for Revision.

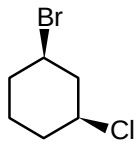
PART - I : ONLY ONE OPTION CORRECT TYPE

1. Which of the following molecule is chiral.

(A) 

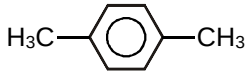
(B) 

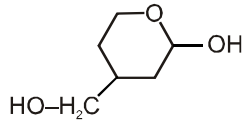
(C) 

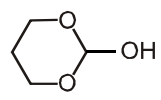
(D) 

2. Which one of the following compounds will show enantiomerism ?

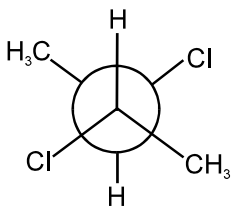
(A) 

(B) 

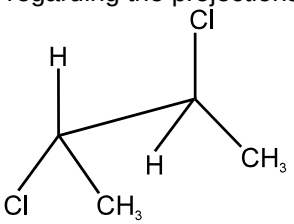
(C) 

(D) 

3. Which of the following statement regarding the projections shown below is true ?



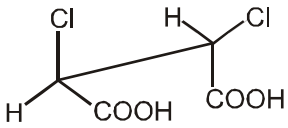
(a)



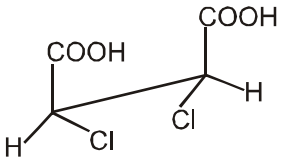
(b)

(A) 'a' and 'b' both represent the same configuration
(B) Both 'a' and 'b' are optically active
(C) 'b' alone is optically active
(D) 'a' alone is optically active

4. The structures represent

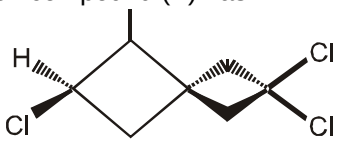


&



(A) geometrical isomers
(B) positional isomers
(C) conformational isomers
(D) configurational isomers

5. The given compound (X) has :



(A) chirality
(B) superimposability on its mirror image isomer
(C) plane of symmetry
(D) C_2 axis of symmetry

6. The compounds X and Y in below reaction can be

$$Ph\text{–}NH\cdot NH_2 + (X) + (Y) \xrightarrow{-H_2O} \underset{\text{organic products}}{P + Q}$$

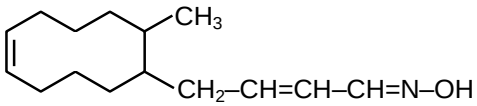
(A) $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-CH_3 + CH_3-\overset{\overset{O}{\|}}{C}-Ph$

(B) $Ph-\overset{\overset{O}{\|}}{C}-CH_3 + CH_3CHO$

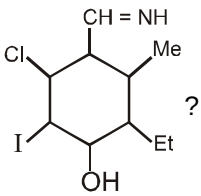
(C) $CH_2{=}O + CH_3CHO$

(D) $CH_2{=}O + CH_3-\overset{\overset{O}{\|}}{C}-CH_3$

7. No. of Geometrical isomers for following compound is :



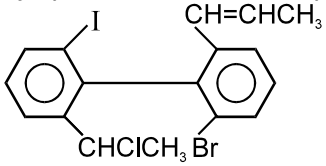
(A) 8 (B) 16 (C) 32 (D) 10

8. How many stereoisomers are possible for 

?

(A) 128 (B) 64 (C) 32 (D) 16

9. How many spatial orientations are possible in the following compound ?



(A) 2 (B) 8 (C) 6 (D) 4

10. Number of conformational isomers of ethane.

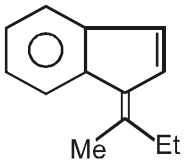
(A) 7 (B) 3 (C) 4 (D) Infinite

PART - II : SINGLE AND DOUBLE VALUE INTEGER TYPE

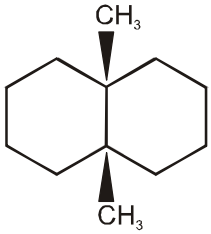
1. How many cyclic and acyclic structural isomers of C_5H_{10} can show geometrical isomerism?

2. In given compounds how many can show geometrical isomerism:

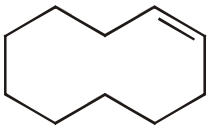
(i)



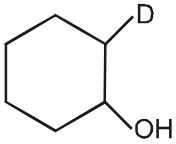
(ii)



(iii)

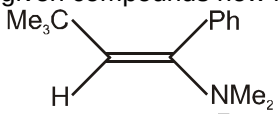


(iv)

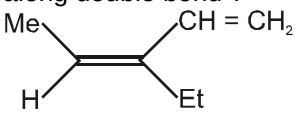


3. In given compounds how many have Z configuration along double bond ?

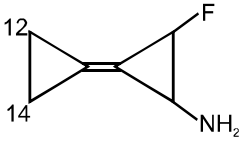
(i)



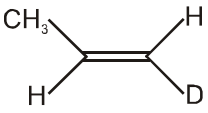
(ii)



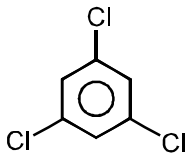
(iii)



(iv)



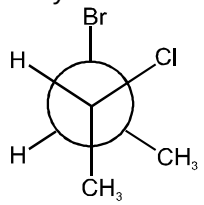
4.

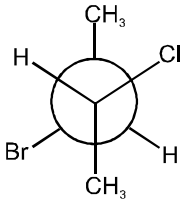


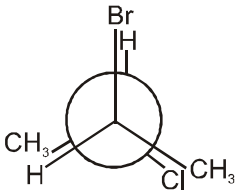
Sum of C_2 & C_3 axis of symmetry is

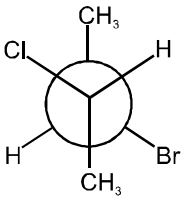
5. Optical rotaion data are expressed in standard way (specific rotation $[\alpha]_D$).
If magnituted of specific rotation of isomer d-lactic acid is 3.82. What will be the magnitude of specific rotation of acetic acid in degree.

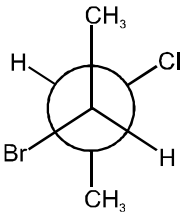
6. How many of the following are (configurational) enantionmers of (A) ?

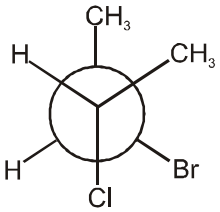
(A) = 

(p) 

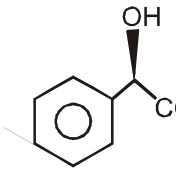
(q) 

(r) 

(s) 

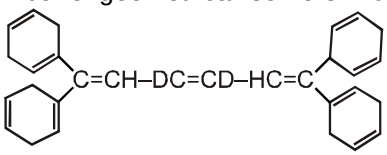
(t) 

7. Pure cholesterol has a specific rotation of –32. A sample of cholesterol prepared in the lab has a specific rotation of –8. The enatiomeric excess of the sample of chloresterol is x%. x is :

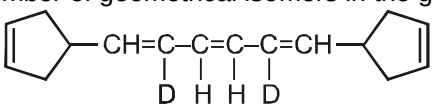
8. Pure (R) Mandelic acid 

has specific rotation of –150. If a sample contains 60% of the R and 40% of its enantiomer, then $[\alpha]$ of this solution is.

9. Total number of geometrical isomers in the given compound are



10. Total number of geometrical isomers in the given compound are :

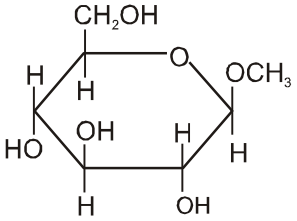


11. Total number of stereoisomers of compound $CH_3-CH=CH-\underset{\displaystyle Cl}{\underset{|}{CH}}-CH=CH-CH_3$ are :

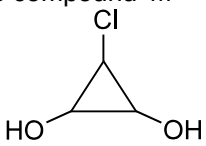
12. Total number of optically active stereoisomers of $CH_3-\underset{\displaystyle Cl}{\underset{|}{CH}}-CH=CH-\underset{\displaystyle Cl}{\underset{|}{CH}}-CH_3$ are :

13. For the compound $A-CH_2-CH_2-A$ draw the newmann projection formula of all the stable conformational isomers if μ_{obs} = 2D and X_{anti} = 0.75 then find μ_{gauche}.(If A = NO_2)

14. Total number of stereoisomers possible for the given structure excluding the configuration mentioned is:



15. Observe the compound 'M'

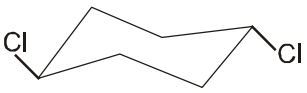
M = 

If in this compound

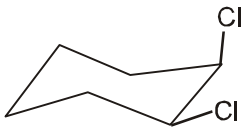
X = Total number of asymmetric C* atoms
Y = Number of similar asymmetric C* atoms
Z = Number of optically active stereoisomers
W = Number of opticaly inactive isomers
R = Number of geometrical orientations in space

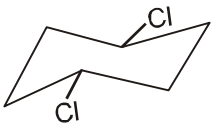
Report your answer as : X + Y + Z + W + R

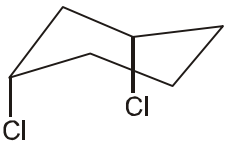
16. How many of the following are cis dichlorocyclohexane.

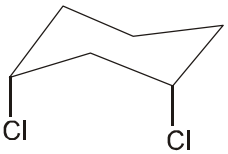
(i) 

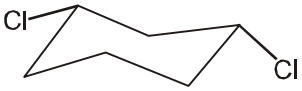
(ii) 

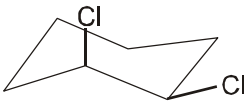
(iii) 

(iv) 

(v) 

(vi) 

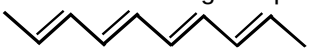
(vii) 

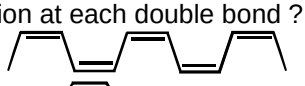
(viii) 

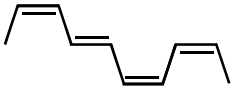
PART - III : ONE OR MORE THAN ONE OPTIONS CORRECT TYPE

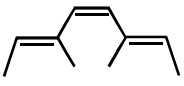
1. What should be the minimum conditions to show geometrical isomerism ?
(A) Restricted rotation about double bond or ring.
(B) Groups which are responsible to show geometrical isomerism differ in their relative distance.
(C) Free rotation about single bond.
(D) Two different groups at both restricted atoms.

2. Which of the following compounds has cis configuration at each double bond ?

(A) 

(B) 

(C) 

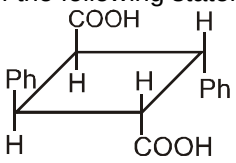
(D) 

3. Which of the following carbonyl compounds can give two oximes on reaction with hydroxyl amine ?
(A) HCHO (B) CH_3CHO (C) PhCHO (D) CH_3COPh

4. Which of the following is true for maleic acid and fumaric acid.
(A) Configurational isomers (B) Stereo isomers
(C) Z and E isomers (D) Constitutional isomers

5. Which of the following is correct statement :
(A) Geometrical isomers are not mirror image isomer.
(B) A compound having double bond (restricted bond) always show geometrical isomerism.
(C) Acyclic compoubd having only single bond does not show geometrical isomerism.
(D) Cyclodecene can show cis & trans form.

6. Which of the following statement(s) is/are correct for given compound :

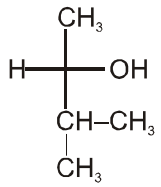


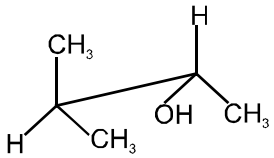
α-truxillic acid

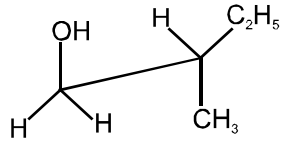
(A) It is a optically active compound
(B) It can show geometrical isomerism
(C) It posses centre of symmetry but not plane of symmetry
(D) It is a meso compound

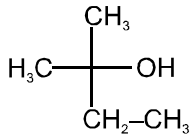
7. Find out correct statement/s.
(A) All chiral centers are stereogenic centers.
(B) All stereogenic centers are not chiral center.
(C) A compound may be chiral without chiral center.
(D) A compound will be chiral only if it has at least one chiral center.

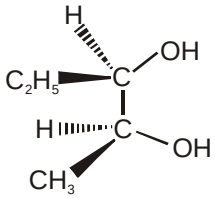
8. Which is/are not the structure of 3-Methyl butan-2-ol.

(A) 

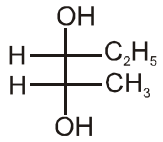
(B) 

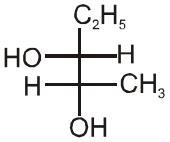
(C) 

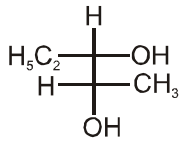
(D) 

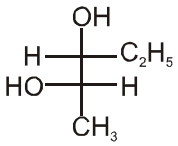
9. 

Fischer projection formula of this compound can be represented as :

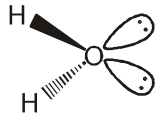
(A) 

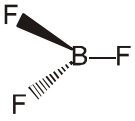
(B) 

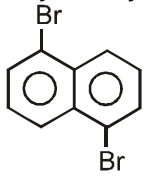
(C) 

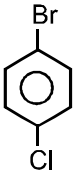
(D) 

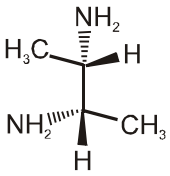
10. Which of the following compounds will have C_2 axis of symmetry ?

(A) 

(B) 

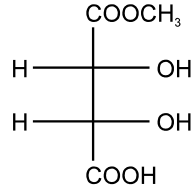
(C) 

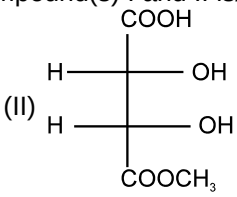
(D) 

11.  is :

(A) optically active molecule. (B) having plane of symmetry.
(C) having axis of symmetry. (D) having centre of symmetry

12. The correct relation between compound(s) I and II is/are

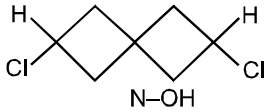
(I) 

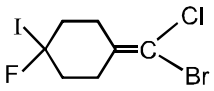
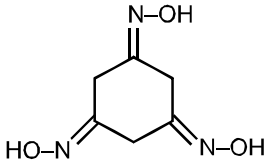
(II) 

(A) identical. (B) diastereomers
(C) enantiomers. (D) configurational isomers

13. Enantiomers have
(A) Similar physical properties (generally).
(B) Similar chemical properties with optical active compounds.
(C) Same absolute value of specific rotation.
(D) Different configurations.

14. Which of the following will show geometrical isomerism?

(A) $CH_3–CH=C=C=CH–CH_3$ (B) 

(C)  (D) 

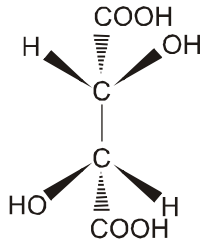
PART - IV : COMPREHENSION

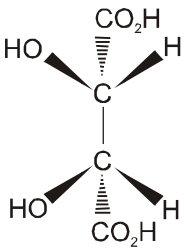
Read the following passage carefully and answer the questions.

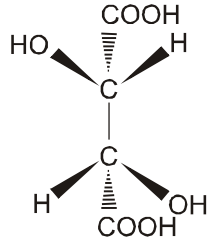
Comprehension # 1

Tartaric acid [$HO_2CCH(OH)CH(OH)CO_2H$] was an important compound in history of stereochemistry. Two naturally occuring forms of tartaric acid are optically inactive. One optically inactive form (P) has a melting point of 210-212°C and can be separated into two optically acitve forms, whereas other optically inactive form (Q) cannot be resolved further.

1. Optically inactive form Q is

(A) 

(B) 

(C) 

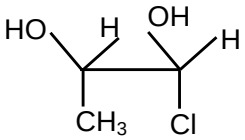
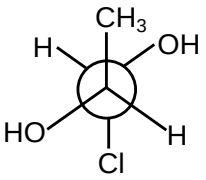
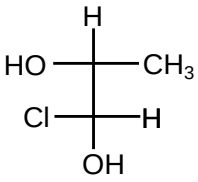
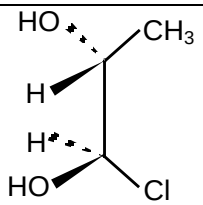
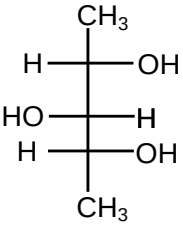
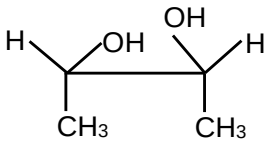
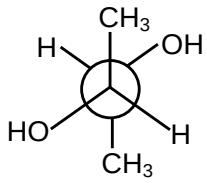
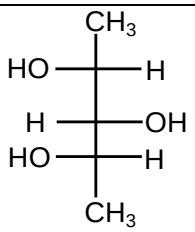
(D) none of these

2. A optically inactive form P is :
(A) Optically inactive due to internal compensation.
(B) Optically inactive due to presence of plane of symmetry.
(C) Optically inactive due to external compensation.
(D) Optically inactive due to intramoleuclar hydrogen bonding.

Comprehension # 2

Q.3, Q.4 and Q. 5 by appropriately matching the information given in the three columns of the following table.

Column-1 & 2 contain projection formula of some molecules & column-3 contains their properties.

Column 1	**Column 2**	**Column 3**
(I) 	(i) 	(P) Compounds having same boiling or melting points.
(II) 	(ii) 	(Q) Compuonds can be separated by fractional distillation.
(III) 	(iii) 	(R) Compounds having different boiling or melting points.
(IV) 	(iv) 	(S) Compounds which are optical resolvable.

3. The correct combination that represents enantiomers with their correct properties.
(A) (III) (iv) (S) (B) (I) (ii) (P) (C) (II) (i) (S) (D) (IV) (iii) (P)

4. The correct combination that represents diastereomers with their correct properties.
(A) (I) (i) (Q) (B) (II) (ii) (P) (C) (IV) (ii) (R) (D) (IV) (iii) (Q)

5.* Which of the following combination gives correct information.
(A) (I) (ii) (Q) (B) (II) (iii) (P) (C) (III) (iv) (P) (D) (IV) (iii) (P)

Exercise-3

PART - I : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)

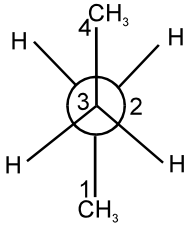
*** Marked Questions may have more than one correct option.**

1. An enantiomerically pure acid is treated with racemic mixture of an alcohol having one chiral carbon. The ester formed will be : **[IIT-JEE-2003(S), 2/84]**
(A) Optically active mixture (B) Pure enantiomer (C) Meso compound (D) Racemic mixture

2. A recemic mixture of (±) 2-phenylpropanoic acid on esterification with (+) 2-butanol gives two ester. Mention the stereochemistry of the two esters produced. **[IIT-JEE-2003(M), 2/60]**

3. Give the Newman projection formula of the least stable staggered form of n–butane. Which of the following reasons is the causes of its unstability ? **[IIT-JEE 2004 (M), 2/60]**
(i) Vander–Waal's strain (ii) Torsional strain (iii) Combination of both.

4. Newman projection of Butane is given, C-2 is rotated by 120º along C-2 & C-3 bond in anticlockwise direction the conformation formed is : **[IIT-JEE 2004, (S) 2/84]**



(A) staggered (B) fully eclipsed (C) gauche (D) partially eclipsed

5. It is given that for conformational isomers, the net dipole moment is **[IIT-JEE-2005, 6/60]**

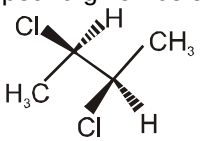
$\mu_{obs} = \Sigma\ \mu_i x_i$

where μ_{obs} = obsereved dipole moment of the compound
μ_i = dipole moment of the stable conformational isomers
x_i = mole fraction of stable conformers

for the compound Z–CH_2–CH_2–Z draw the Newman projection formula of all the stable conformational isomers, if μ_{obs} = 1D, and x_{anti} = 0.82, and find μ_{gauche}. Now draw the Newman projection formula of the most stable conformation of meso Y–CHD–CHD–Y.
(a) If Y is CH_3 (rotation about C_2–C_3 bond)
(b) If Y is OH (rotation about C_1–C_2 bond)

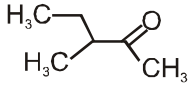
6. **Statement-1 :** Molecules that are not superimposable on their mirror images are chiral. because
Statement-2 : All chiral molecules have chiral centres. **[IIT-JEE-2007, 3/162]**
(A) Statement-1 is true, statement-2 is true; statement-2 is a correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true; statement-2 is NOT a correct explanation for statement-1.
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.

7.* The correct statement(s) about the compound given below is (are). **[IIT-JEE-2008, 4/163]**

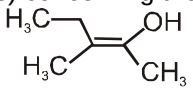


(A) The compound is optically active (B) The compound possesses centre of symmetry
(C) The compound possesses plane of symmetry (D) The compound possesses axis of symmetry

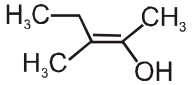
8.* The correct statements(s) concerning the structures E, F and G is (are) : **[IIT-JEE-2008, 4/163]**



(E)



(F)



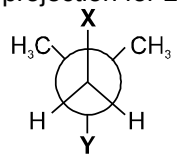
(G)

(A) E, F and G are resonance structures (B) E, F and E, G are tautomers
(C) F and G are geometrical isomers (D) F and G are diastereomers

9.* The correct statement(s) about the compound $H_3C(HO)HC–CH=CH–CH(OH)CH_3$ **(X)** is(are) :
[IIT-JEE 2009, 4/160]
(A) The total number of stereoisomers possible for X is 6.
(B) The total number of diastereomers possible for X is 3.
(C) If the stereochemistry about the double bond in X is trans, the number of enantiomers possible for X is 4.
(D) If the stereochemistry about the double bond in X is cis, the number of enantiomers possible for X is 2.

10. The total number of cyclic structural as well as stereo isomers possible for a compound with the molecular formula C_5H_{10} is **[IIT-JEE 2009, 4/160]**

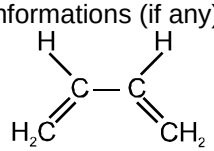
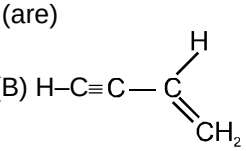
11.* In the Newman projection for 2, 2-Dimethylbutane



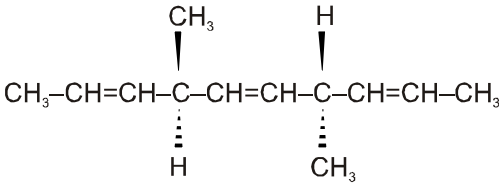
X and **Y** can respectively be : **[IIT-JEE-2010, 3/163]**

(A) H and H (B) H and C_2H_5 (C) C_2H_5 and H (D) CH_3 and CH_3

12.* Amongst the given options, the compound(s) in which all the atoms are in one plane in all the possible conformations (if any), is (are) **[JEE-2011, 4/180]**

(A)  (B)  (C) $H_2C=C=O$ (D) $H_2C=C=CH_2$

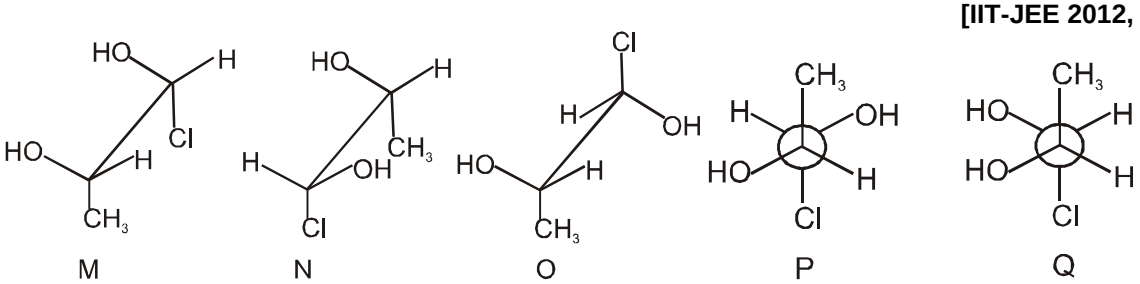
13. The number of optically active products obtained from the **complete** ozonolysis of the given compound is:



[IIT-JEE 2012, 3/136]

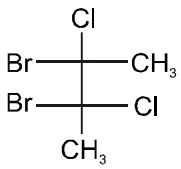
(A) 0 (B) 1 (C) 2 (D) 4

14.* Which of the given statement(s) about N, O, P and Q with respect to M is (are) correct ? **[IIT-JEE 2012, 4/136]**

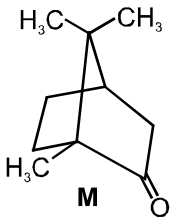


(A) M and N are non-mirror image stereoisomers
(B) M and O are identical
(C) M and P are enantiomers
(D) M and Q are identical

15. The total number(s) of **<u>stable</u>** conformers with non-zero dipole moment for the following compound is (are): **[JEE(Advanced)-2014, 3/120]**



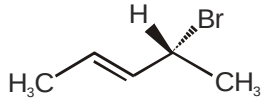
16. The total number of stereoisomers that can exist for **M** is **[JEE(Advanced)-2015, 4/168]**

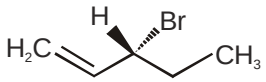


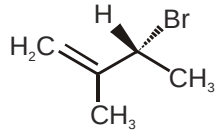
M

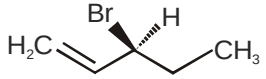
17.* Compound(s) that on hydrogenation produce(s) optically inactive compound(s) is (are)

[JEE(Advanced)-2015, 4/168]

(A) 

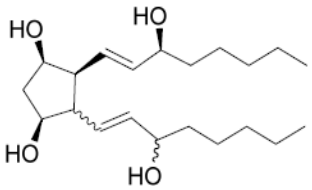
(B) 

(C) 

(D) 

18. For the given compound X, the total number of optically active stereoisomers is …….

[JEE(Advanced)-2018, 3/120]



X

 This type of bond indicates that the configuration at the specific carbon and the geometry of the double bond is fixed

 This type of bond indicates that the configuration at the specific carbon and the geometry of the double bond is **NOT** fixed

PART - II : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

JEE(MAIN) OFFLINE PROBLEMS

1. Racemic mixture is formed by mixing two : **[AIEEE 2002, 3/225]**

(1) Isomeric compounds (2) Chiral compounds

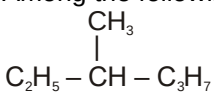
(3) Meso compounds (4) Optical isomers

2. Which of the following does not show geometrical isomerism ? **[AIEEE 2002, 3/225]**

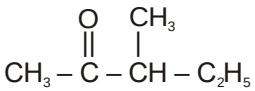
(1) 1,2-Dichloro-1-pentene (2) 1,3-Dichloro-2-pentene

(3) 1,1-Dichloro-1-pentene (4) 1,4-Dichloro-2-pentene

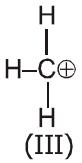
3. Among the following four structures I to IV.



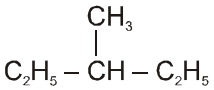
(I)



(II)



(III)



(IV)

it is true that : **[AIEEE 2003, 3/225]**

(1) all four are chiral compounds (2) only I and II are chiral compounds

(3) only III is a chiral compound (4) only II and IV are chiral compounds

4. Which of the following will have a meso-isomer also ? **[AIEEE 2004, 3/225]]**

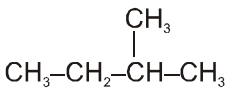
(1) 2-Chlorobutane (2) 2,3-Dichlorobutane

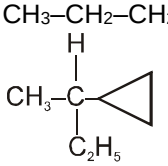
(3) 2,3-Dichloropentane (4) 2-Hydroxypropanoic acid

5. Amongst the following compounds, the optically acitve alkane having lowest molecular mass is

[AIEEE 2004, 3/225]

(1) $CH_3–CH_2–CH_2–CH_3$

(2) 

(3) 

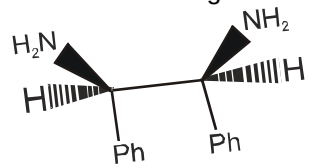
(4) $CH_3–CH_2–C\equiv CH$

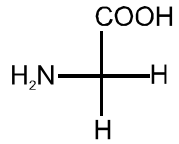
6. Which of the following compounds is not chiral ? **[AIEEE 2004, 3/225]**
(1) 1–Chloropentane (2) 2-Chloropentane
(3) 1-Chloro-2-methylpentane (4) 3-Chloro-2-methylpentane

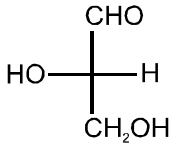
7. Which type of isomerism is shown by 2,3-dichlorobutane ? **[AIEEE 2005, 3/225]**
(1) diastereomerism (2) optical-isomerism
(3) geometric-isomerism (4) structural-isomerism

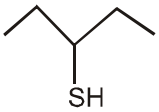
8. Increasing order of stability among the three main conformations (i.e. eclipse, anti, gauche) of 2-fluoroethanol is **[AIEEE- 2006, 3/165]**
(1) eclipse, gauche, anti (2) gauche, eclipse, anti
(3) eclipse, anti, gauche (4) anti, gauche, esclipse

9. Which of the following molecules is expected to rotate the plane of polarized light? **[AIEEE 2007, 3/120]**

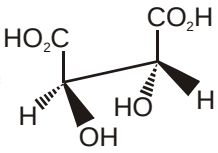
(1) 

(2) 

(3) 

(4) 

10. Which one of the following conformations of cyclohexane is chiral? **[AIEEE-2007, 3/120]**
(1) Chair (2) Boat (3) Twist boat (4) Rigid

11. The absolute configuration of 

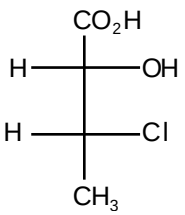
is **[AIEEE 2008, 3/105]**
(1) R, R (2) R, S (3) S, R (4) S, S

12. The alkene that exhibits geometrical isomerism is : **[AIEEE 2009, 4/144]**
(1) 2-methyl propene (2) 2-butene (3) 2-methyl-2-butene (4) propene

13. The number of stereoisomers possible for a compound of the molecular formula CH_3–CH=CH–CH(OH)–Me is: **[AIEEE 2009, 4/144]**
(1) 2 (2) 4 (3) 6 (4) 3

14. Out of the following, the alkene that exhibits optical isomerism is. **[AIEEE 2010, 4/144]**
(1) 3-methyl-2pentene (2) 4-methyl-1-pentene
(3) 3-methyl-1-pentene (4) 2-methyl-2-pentene

15. Which of the following compound will exhibit geometrical isomerism ? **[JEE(Main) 2015, 4/120]**
(1) 1-Phenyl-2-butene (2) 3-Phenyl-1-butene
(3) 2-Phenyl-1-butene (4) 1,1-Diphenyl-1-propane

16. The absolute configuration of 

is **[JEE(Main) 2016, 4/120]**
(1) (2S, 3R) (2) (2S, 3S) (3) (2R, 3R) (4) (2R, 3S)

JEE(MAIN) ONLINE PROBLEMS

1. Which one of the following acids does not exhibit optical isomerism?

[JEE(Main) 2014 Online (12-04-14), 4/120]

(1) Lactic acid (2) Tartaric acid (3) Maleic acid (4) α-amino acid

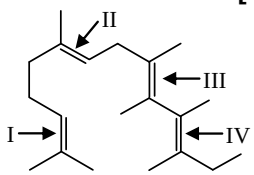
2. The optically inactive compound from the following is : **[JEE(Main) 2015 Online (10-04-15), 4/120]**

(1) 2-chloropentane (2) 2-chloropropanal

(3) 2-chloro-2-methylbutane (4) 2-chlorobutane

3. In the following structure, the double bonds are marked as I, II, III and IV

[JEE(Main) 2017 Online (09-04-17), 4/120]



Geometrical isomerism is not possible at site (s) :

(1) I (2) III (3) I and III (4) I and IV

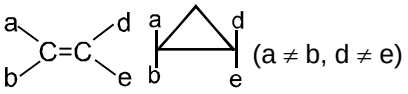
Answers

EXERCISE - 1

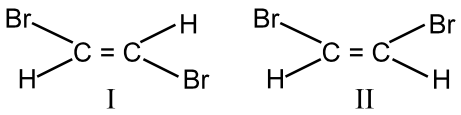
PART - I

A-1. Restricted rotation present in all the options but geometircal isomersim shown by ii, iii, iv, vii.

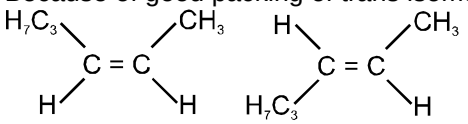
A-2. Essential conditions for geometrical isomerism are
(1) Restricted rotation must present.
(2) Two different groups must be present on both restricted atoms.
(3) Groups responsible to show geometrical isomerism must be nearly in the same plane.

A-3. The bond across which atoms cannot rotate without breaking the bonds is called restricted rotation. e.g. C=C, C=N, ring etc.  ($a \neq b$, $d \neq e$)

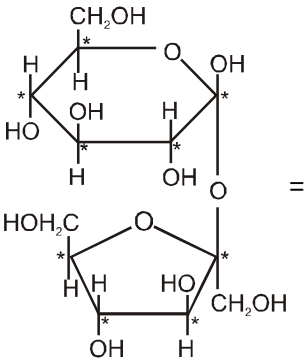
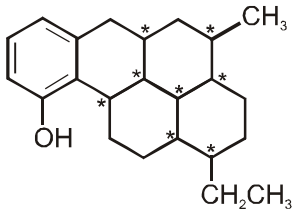
A-4. (iii), (iv), (vi), (vii) and (viii) **A-5.** 5 (i, ii, iv, v, vi) **B-1.** (i) = E, (ii) = E, (iii) = E, (iv) = Z

B-2. **(a)** 
I II
dipole moment : II > I

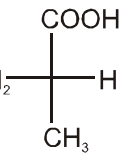
(b) Because of good packing of trans isomers.

(c) 
Cis-Hex-2-ene Trans-Hex-2-ene
Cis has higher boiling point due to more polarity.

C-1. W has 3, X has zero, Y has 2 and Z has only one chiral centres.

C-2. (i)  = 9 (ii)  = 8

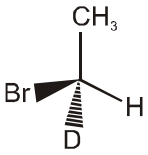
D-1. (I) R (II) S (III) R (IV) (R, R)

D-2. (I) D (II) (2D, 3D) (III) Equivalent fischer projection is  and configuration L.

D-3. RRRR

E-1. (i) Plane of symmetry and Centre of symmetry.
(ii) Plane of symmetry.
(iii) Plane of symmetry.
(iv) Plane of symmetry.
(v) Plane of symmetry and Centre of symmetry.

E-2. (i) POS present and COS, AOS absent. (ii) POS present and COS, AOS absent.
(iii) POS, AOS present and COS absent. (iv) POS, COS present and AOS present.
(v) POS present and COS, AOS absent. (vi) POS, COS and AOS absent.

Compound  has a single chiral centre which has no plane of symmetry.

F-1. Enantiomeric pair ≡ (I & III)
Diastereomeric pairs ≡ (I & II), (II & III)

F-2. (I) Enantiomers (II) Position isomers (III) Identical (IV) Diastereomers

F-3. (a) functional isomers (b) Enantiomers (c) Geometrical isomers (d) Diastereomers

F-4. (i) Mixture of I, II and III give two fraction on fractional distillation.
(ii) I, II and III all are optically active
(iii) I and II are pair of enantiomers
(iv) I and III are optical diastereomer.

G-1. D/L represent nomenclature (relative configuration) while d/ represents direction of optical rotation.

G-2. Specific rotation is the number of degrees of rotation observed if a 1-dm (10-cm) tube is used and the compound has concentration 1gm/mL.Thus specific rotation [α] is

$$[\alpha]_t^{\lambda} = \frac{\theta}{\ell \times C}$$

Where, [α] = Specific rotation; θ = observed angle of rotation (degree)
 = Pathlength (dm); C = concentration (gm/ml)
λ = wavelength (nm); t = temperature (25°C)

G-3. % Optical purity = $\frac{\text{observed optical rotation}}{\text{optical rotation of pure enantiomer}} \times 100$

% Enantiomeric excess = $\frac{|d-\ell|}{d+\ell} \times 100 = \frac{\text{excess of one enantiomer over other}}{\text{entire mixture}} \times 100$

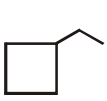
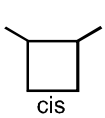
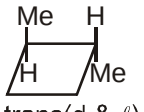
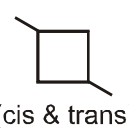
G-4. 4 **H-1.** i, ii, iii, iv **H-2.** ii, iii, v, vi **I-1.** (i) 3, (ii) 2, (iii) 2, (iv) 8

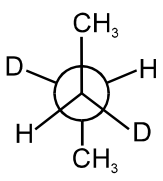
I-2. 3 (oct-2-ene, oct-3-ene, oct-4-ene)

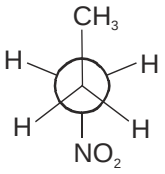
I-3. CH_3–HC=CH–CH_2–CH=CH–COOH
Four geometrical isomers are possible.

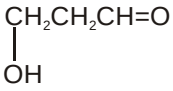
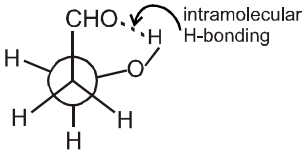
I-4. (I) $CH_3-\overset{*}{C}H(OH)-CH=\overset{*}{C}H-CH_3$

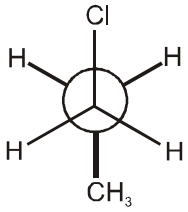
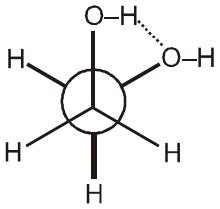
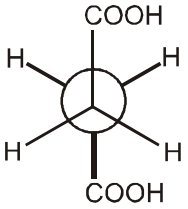
Number of stereocentres = 2 so total number of stereoisomers = $2^2 = 4$
(II) All 4 isomers are optically active.
(III) Total enantiomeric pairs are 2, hence number of fraction will be 2.

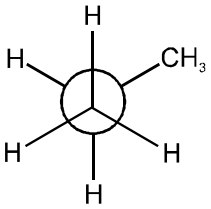
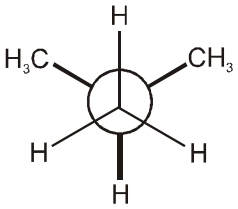
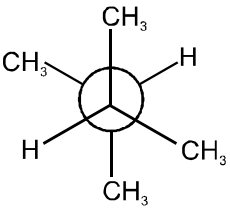
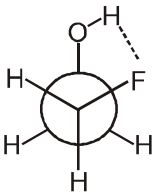
I-5. **T**otal=7   cis  trans(d & ℓ)   (cis & trans)

I-6. 6 **J-1.** Fully Eclipsed **J-2.** 

J-3.  antiform, it is most polar & stable.

J-4.  ; 

J-5. (I)  (II)  (III) 

J-6. (i)  (II)  (iii)  (iv) 

K-1. (i) trans (ii) cis (iii) trans (iv) cis (v) trans (vi) cis (vii) cis

K-2. First is more stable because of less steric repulsion between groups at equitorial position.

PART - II

A-1.	(C)	**A-2.**	(D)	**A-3.**	(D)	**A-4.**	(A)	**A-5.***	(BC)
B-1.	(A)	**B-2.**	(D)	**B-3.**	(D)	**C-1.**	(B)	**C-2.**	(B)
C-3.	(C)	**D-1.**	(C)	**D-2.**	(B)	**D-3.**	(A)	**D-4.**	(A)
D-5.	(A)	**E-1.**	(C)	**E-2.**	(B)	**E-3.**	(A)	**F-1.**	(D)
F-2.	(A)	**F-3.**	(D)	**F-4.**	(A)	**F-5.**	(B)	**F-6.**	(B)
G-1.	(D)	**G-2.**	(B)	**G-3.**	(B)	**G-4.**	(C)	**G-5.**	(A)
G-6.	(A)	**G-7.**	(D)	**H-1.***	(CD)	**H-2.**	(D)	**H-3.**	(A)
H-4.	(CD)	**I-1.**	(B)	**I-2.**	(C)	**I-3.**	(B)	**I-4.**	(B)
I-5.	(A)	**I-6.**	(C)	**I-7.**	(A)	**I-8.**	(D)	**I-9.**	(C)
J-1.	(A)	**J-2.**	(A)	**J-3.**	(D)	**J-4.**	(C)	**J-5.**	(A)
J-6.	(C)	**J-7.**	(A)	**J-8.**	(D)	**J-9.**	(C)	**J-10.**	(B)
J-11.	(C)	**K-1.**	(D)	**K-2.**	(A)	**K-3.**	(A)	**K-4.**	(C)
K-5	(B)	**K-6.**	(D)						

PART - III

1. (A - p,s); (B - p,s); (C - p,s); (D - q,r) **2.** (A - r); (B - q, r); (C - p, s); (D - s)

EXERCISE - 2

PART - I

1.	(D)	**2.**	(C)	**3.**	(C)	**4.**	(D)	**5.**	(A)
6.	(D)	**7.**	(B)	**8.**	(A)	**9.**	(B)	**10.**	(B)

PART - II

1.	2	**2.**	4 (i, ii, iii, iv)	**3.**	1 (ii)	**4.**	3 + 1 = 4	**5.**	0
6.	4 (q, r, s, t)	**7.**	25	**8.**	30	**9.**	4	**10.**	6
11.	4	**12.**	4	**13.**	8	**14.**	31	**15.**	12
16.	5 (iii, v, vi, vii, viii)								

PART - III

1.	(ABD)	**2.**	(BD)	**3.**	(BCD)	**4.**	(ABC)	**5.**	(ACD)
6.	(BC)	**7.**	(ABC)	**8.**	(CD)	**9.**	(ABCD)	**10.**	(ABCD)
11.	(AC)	**12.**	(CD)	**13.**	(ACD)	**14.**	(AD)		

PART - IV

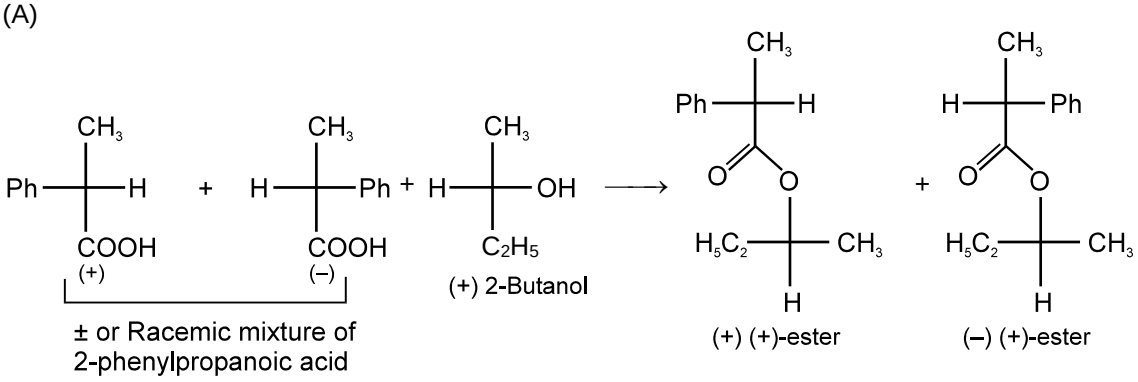
1.	(B)	**2.**	(C)	**3.**	(C)	**4.**	(D)	**5.**	(AC)

EXERCISE - 3

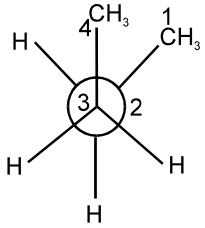
PART - I

1. (A)

2.



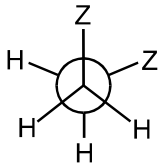
3. Least stable staggered form of n–butane is



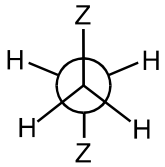
This is due to Vander Waal's strain developed between the methyl groups at C_2 & C_3. There is no torsional strain in the staggered form at torsional angle 60º.

4. (C)

5.



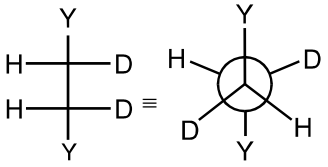
Gauche form



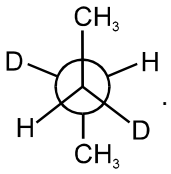
Anti form

μ_{obs} = 1D $\quad$ x_{gauche} = 0.18

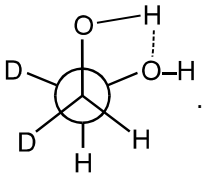
$\Rightarrow \quad \mu_{obs} = \Sigma\mu_i x_i \quad \Rightarrow \quad 1 = \mu_{gauche} \times 0.18 + 0.82 \times 0 \quad \Rightarrow \quad \mu_{gauche} = \frac{1}{0\ .\ 18} = 5.55\ D$



meso

(a) If Y is CH_3, the Newman projection is 

.

(b) If Y is OH, the Newman projection is 

.

6.	(C)	**7.***	(AD)	**8.***	(BCD)	**9.***	(AD)	**10.**	7		
11.	(BD)	**12.**	(BC)	**13.**	(A)	**14.**	(ABC)	**15.**	3		
16.	2	**17.**	(BD)	**18.**	7						

PART - II

JEE(MAIN) OFFLINE PROBLEMS

1.	(4)	**2.**	(3)	**3.**	(2)	**4.**	(2)	**5.**	(3)	**6.**	(1)	**7.**	(2)
8.	(3)	**9.**	(3)	**10.**	(3)	**11.**	(1)	**12.**	(2)	**13.**	(2)	**14.**	(3)
15.	(1)	**16.**	(1)								

JEE(MAIN) ONLINE PROBLEMS

1.	(3)	**2.**	(3)	**3.**	(1)