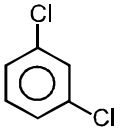
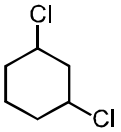
Exercise-1

✍ **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?

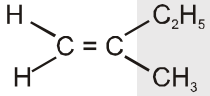
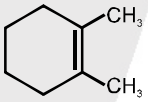
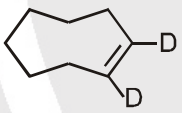
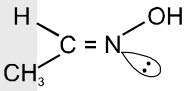
(i)  (ii)  (iii) ClCH=CHCl (iv) Ph–N=N–Ph

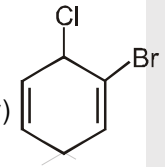
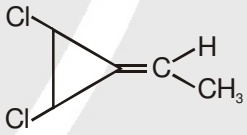
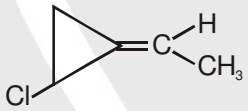
(v) $CH_3CH=C(CH_3)_2$ (vi) $CH_3CH = CH_2$ (vii) $CH_3CH=CHCH_3$ (viii) $CH_3–C\equiv C–CH_3$

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

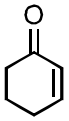
A-3. Define restricted rotation and give one example each of acyclic and cyclic compound, which can show geometrical isomersm.

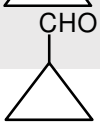
A-4. Which of the following can show geometrical isomerism.

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

(v)  (vi)  (vii)  (viii) $CH_2=CH–CH=CH–Ph$

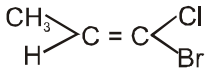
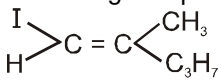
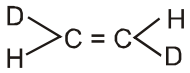
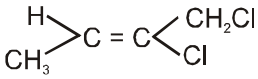
A-5.✍ Which of the following carbonyl compound will give two products after reaction with NH_2OH :

(i)  (ii) $CH_3–CHO$ (iii) 

(iv) DCHO (v)  (vi) 

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

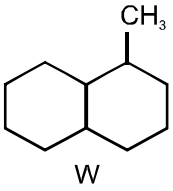
B-1. Indicate whether each of the following compound is 'E' or 'Z'.

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

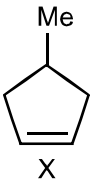
B-2.✍ **(a)** BrHC=CHBr exists as two diastereomers draw them and compare their dipole moment.
(b) trans-Butenedioic acid has higher melting point than cis-butenedioic acid. Why ?
(c) Draw the cis and trans structures of hex-2-ene. Which isomer will have higher b.p. and why ?

Section (C) : Chiral carbon and Projection Formula

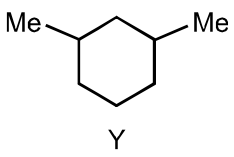
C-1. Number of chiral carbon atoms in the compound W, X, Y and Z respectively would be :



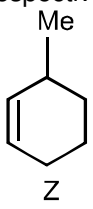
W



X

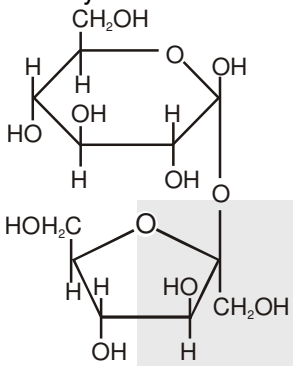


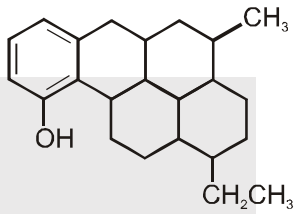
Y



Z

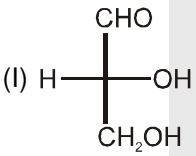
C-2. How many number of chiral centres present in the following compounds ?

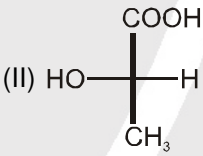
(i) 
D(+)-Sucrose

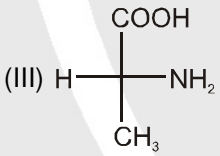
(ii) 

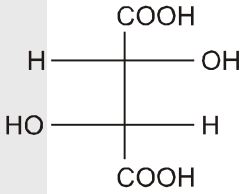
Section (D) : R/S & D/L Naming.

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

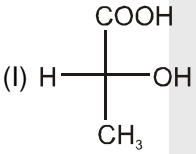
(I) 

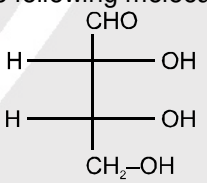
(II) 

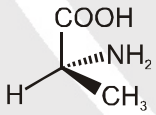
(III) 

(IV) 

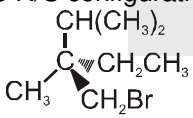
D-2. Find D/L configuration in the following molecules.

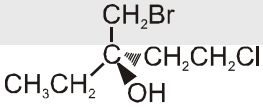
(I) 

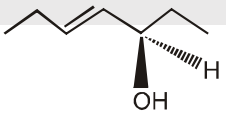
(II) 

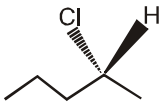
(III) 

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

(a) 

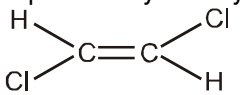
(b) 

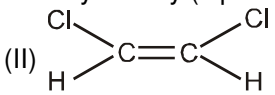
(c) 

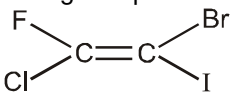
(d) 

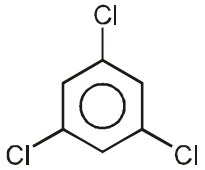
Section (E) : Element of Symmetries (POS, COS, AOS)

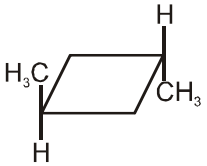
E-1. Find plane of symmetry and centre of symmetry (if possible) in the following compounds.

(I) 

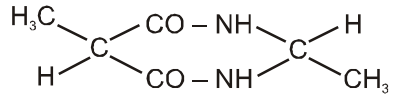
(II) 

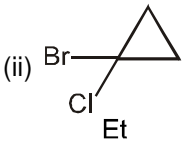
(III) 

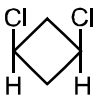
(IV) 

(V) 

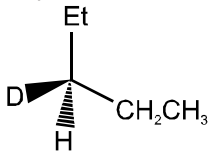
E-2. Find plane of symmerty, centre of symmerty and axis of symmetry (if possible) in the following molecules.

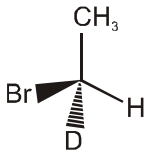
(i) 

(ii) 

(iii) 

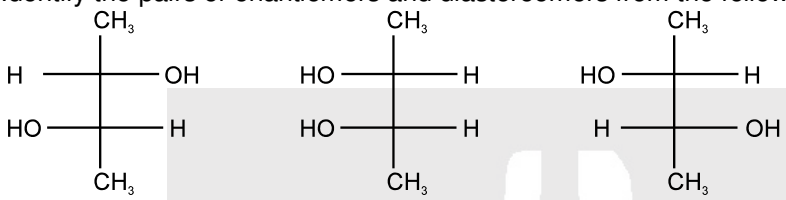
(iv) 

(v) 

(vi) 

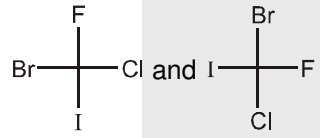
Section (F) : Definition and Properties of Enantiomers, Diastereomers, Mesocompounds

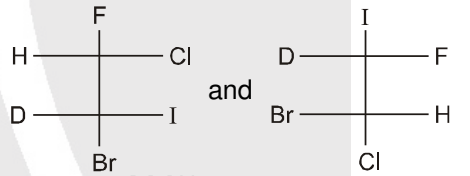
F-1. Identify the pairs of enantiomers and diastereomers from the following compounds I, II and III :

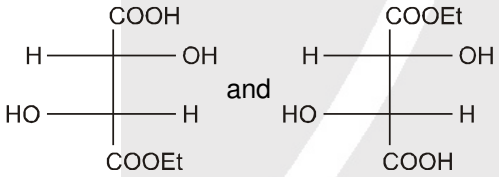


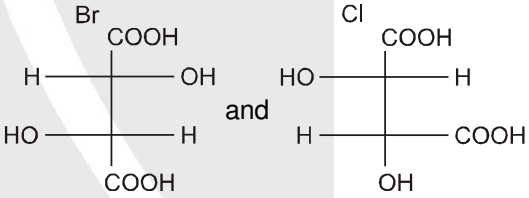
(I) (II) (III)

F-2. Find relationship between the given pairs.

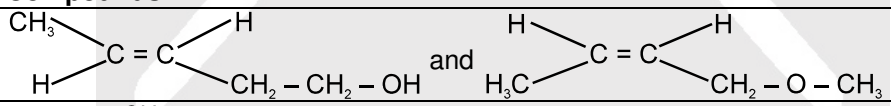
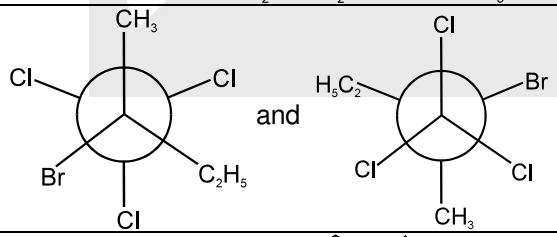
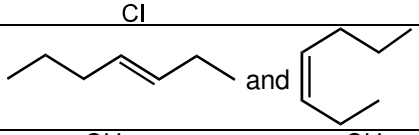
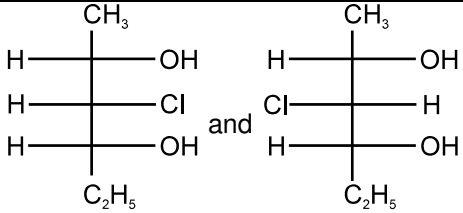
(I) 

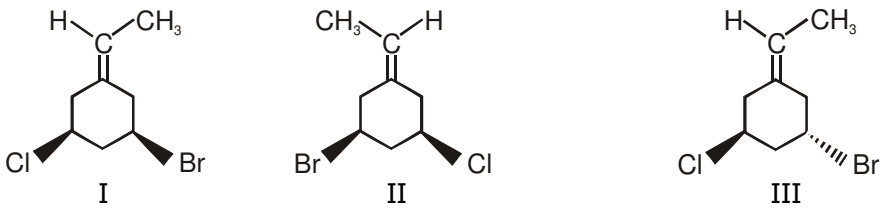
(II) 

(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.

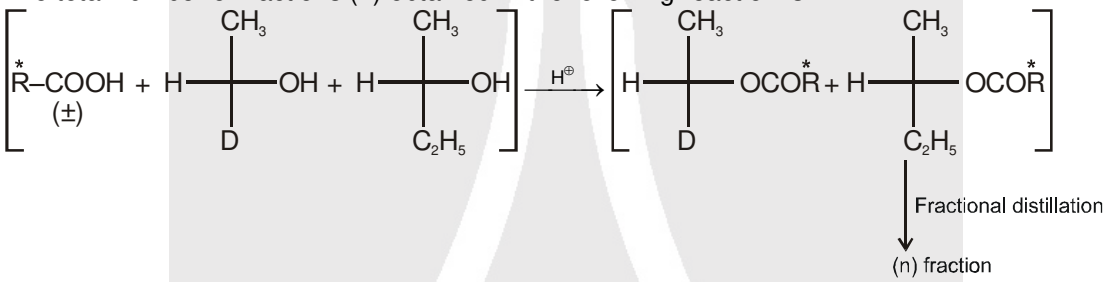
Section (G): Specific rotation, optical purity, enantiomeric excess and Optical Resolution

G-1. What does D/L & d/ℓ represent.

G-2. Write the definition of specific rotation.

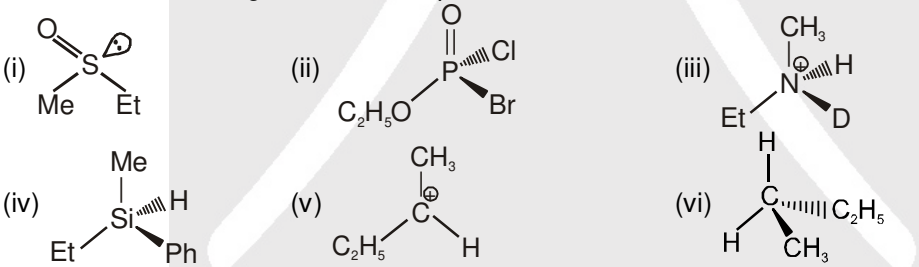
G-3. Write the formula for optical purity & enantiomeric excess.

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

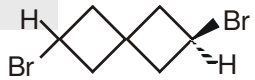


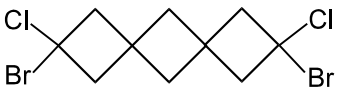
Section (H) : Optical active compounds without chiral carbon and Amine inversion

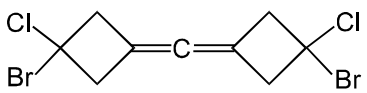
H-1. Which of the following are chiral compound.

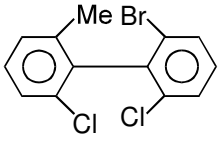


H-2. Which of the following are chiral molecules

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

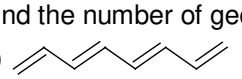
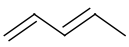
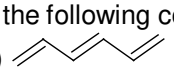
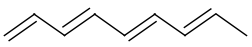
(iv) 

(v) 

(vi) 

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.

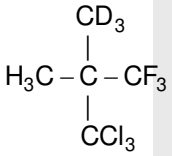
I-6. The number of isomers for the compound with molecular formula $C_2BrClFI$ are :

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. Consider all types of C–C bond rotation in following molecule.



How many number of different types of eclipsed conformations are possible? Draw Newman conformations of all eclipsed form.

J-4. Write the most polar and most stable conformer of 1-nitropropane.

J-5. Draw the most stable conformer of 3-hydroxypropanal.

J-6. 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.

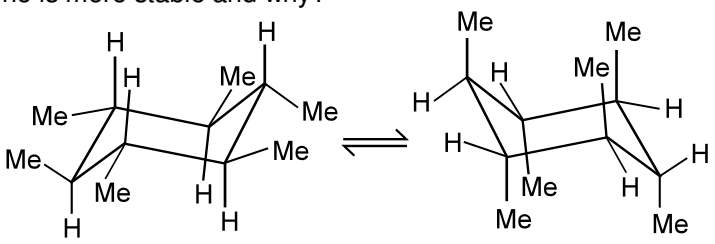
J-7. Draw the most stable Newman projection formula along C_1–C_2 bonds of following compounds.

(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) $CH_3-\overset{1}{C}H(CH_3)-\overset{2}{C}H(CH_3)-CH_3$ (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

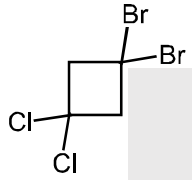
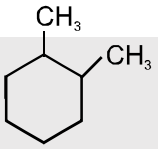
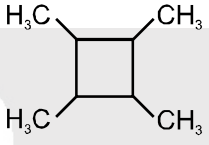
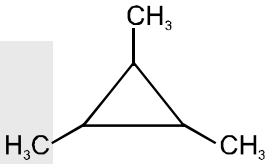
Section (A) : Geometrical isomerism

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

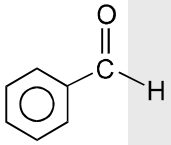
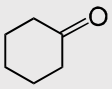
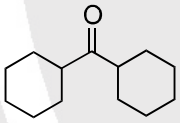
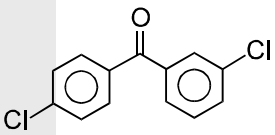
A-2. Which can show the cis-trans isomerism :
(A) $ClCH_2CH_2Cl$ (B) $Cl_2C=CH_2$ (C) $Cl_2C=CCl_2$ (D) $ClCH=CHCl$

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 ?

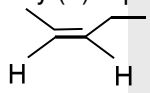
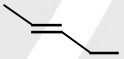
(A)  (B)  (C)  (D) 

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

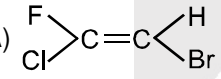
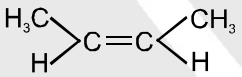
(A)  (B)  (C)  (D) 

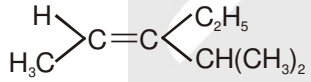
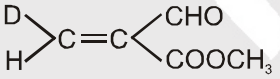
Section (B) : CIP Rules (E/Z Naming) & Physical Properties of G.I

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

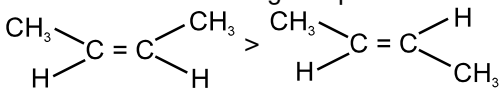
(A)  (B)  (C)  (D) 

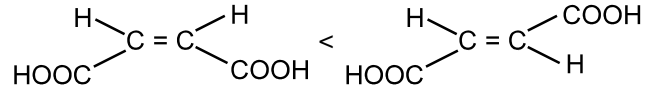
B-2. The 'E'-isomer is/are :

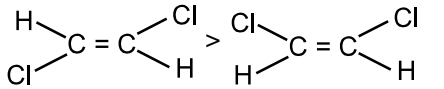
(A)  (B) 

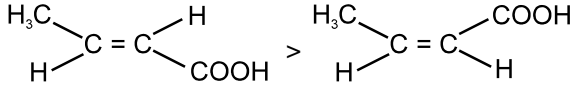
(C)  (D) 

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)

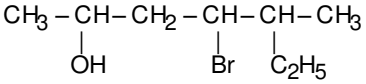
Section (C) : Chiral carbon and Projection Formula

C-1. Chiral molecules are :

(A) Superimposable on their mirror image (B) Not superimposable on their mirror image

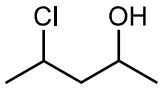
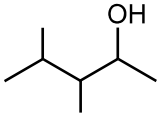
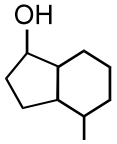
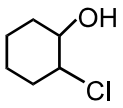
(C) unstable molecules (D) capable of showing geometrical isomerism

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



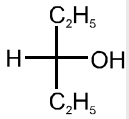
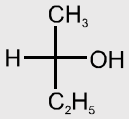
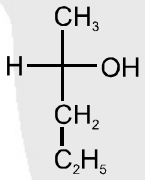
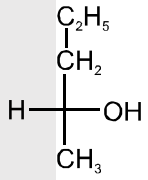
(A) 2 (B) 3 (C) 4 (D) 5

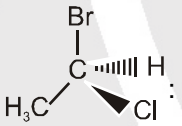
C-3. The compound which has maximum number of chiral centres is

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

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

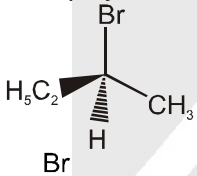
D-1. Which of the following is the structure of (S)-Pentan-2-ol is ?

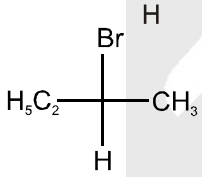
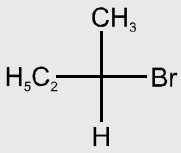
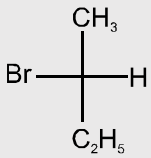
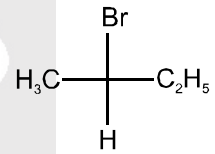
(A)  (B)  (C)  (D) 

D-2. The configuration of the given compound is  :

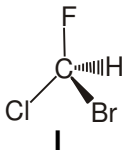
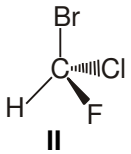
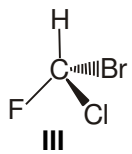
(A) E (B) R (C) S (D) Z

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



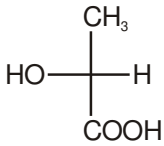
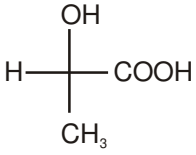
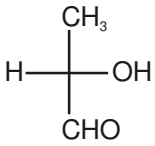
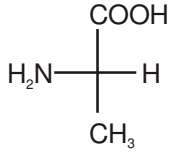
(A)  (B)  (C)  (D) 

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

 **I**  **II**  **III**

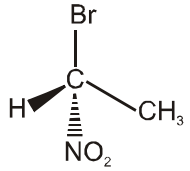
(A) I & II (B) II & III (C) I & III (D) All

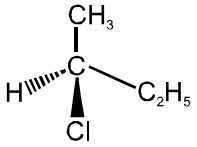
D-5. Which has D configuration.

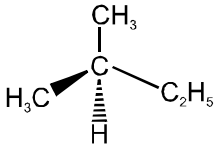
(A)  (B)  (C)  (D) 

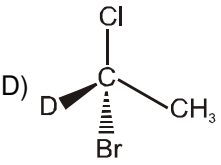
Section (E) : Element of Symmetries (POS, COS, AOS)

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

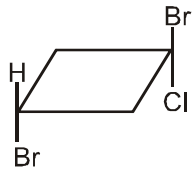
(A) 

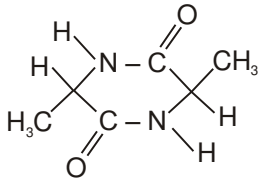
(B) 

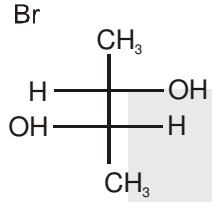
(C) 

(D) 

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

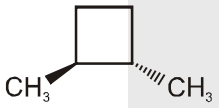
(A) 

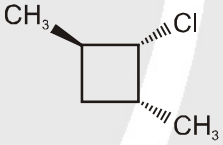
(B) 

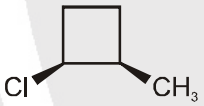
(C) 

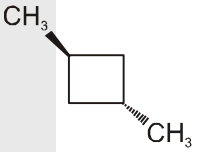
(D) 

E-3. Which of the following are chiral :

(1) 

(2) 

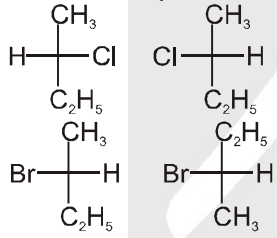
(3) 

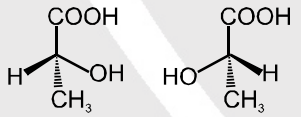
(4) 

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

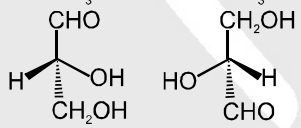
Section (F) : Definition and Properties of Enantiomers, Diastereomers, Meso compounds

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

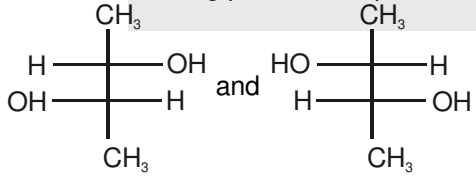
(A) 

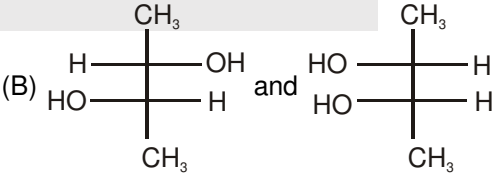
(B) 

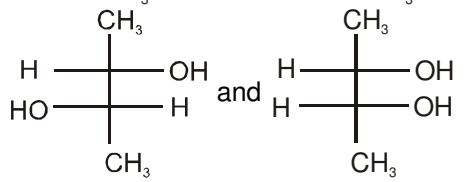
(C)

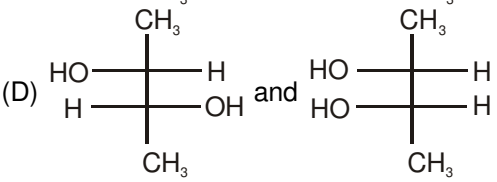
(D) 

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

(A) 

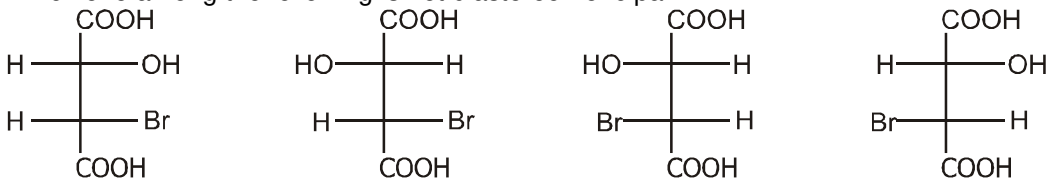
(B) 

(C) 

(D) 

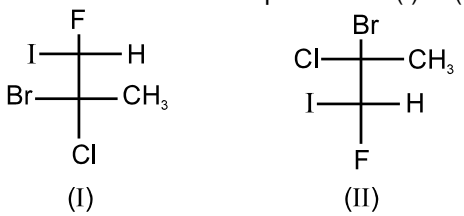
F-3. Stereoisomers which are not mirror image of each other, are called :
(A) Enantiomers (B) Tautomers (C) Meso (D) Diastereomers

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

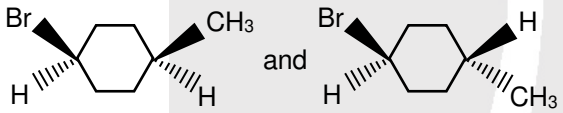


(A) I and III (B) I and II (C) II and III (D) I and IV

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



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

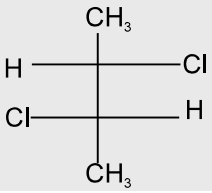
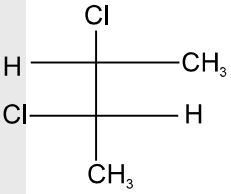
F-6.  and are :

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

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

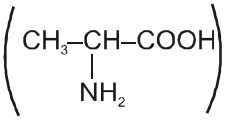
G-1. The instrument which can be used to measure optical activity, i.e., specific rotation:
(A) Refractometer (B) Photometer (C) Voltmeter (D) Polarimeter

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 :

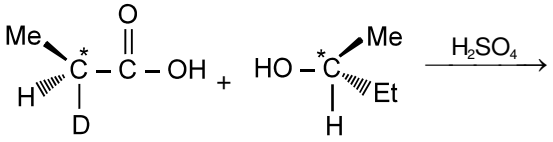
(A) –36º (B) 0º (C) +36º (D) unpredictable

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) (ℓ)-2-Chlorobutanoic acid
(3) (±) -2-Butanol (4) (dℓ 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

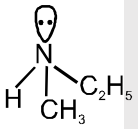
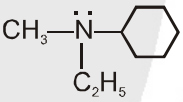
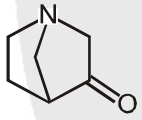
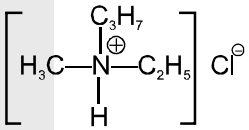


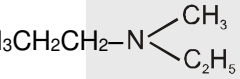
(A) A single stereoisomer (optically active)
(B) A mixture of diastereomers (both optically active)
(C) A racemic mixture (optically inactive)
(D) A mixture of four stereoisomers (two racemic mixtures)

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 ?

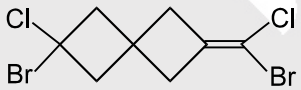
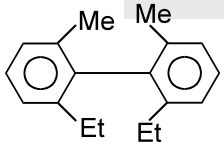
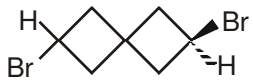
(A) 
(B) 
(C) 
(D) 

H-2. Which of the following amine is optically active?
(A) CH_3NH_2 (B) $CH_3NHC_2H_5$
(C)  (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 ?

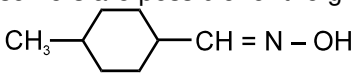
(A) 
(B) 
(C) 
(D) 

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

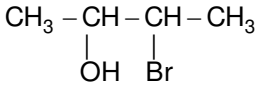
I-2. How many geometrical isomers are possible for the given compound?
$CH_3–CH=CH–CH=CH–CH=CH_2$
(A) 2 (B) 3 (C) 4 (D) 8

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



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

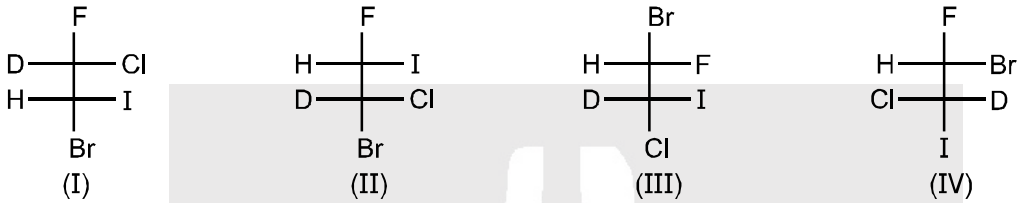
I-4. Total number of stereoisomers of compound is :



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

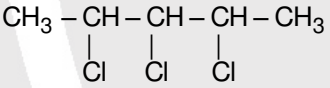
I-5. Total number of optically active stereoisomers of tartaric acid is
(A) 2 (B) 4 (C) 3 (D) 0

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



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

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

I-7. Total number of optically active stereoisomers of 

(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

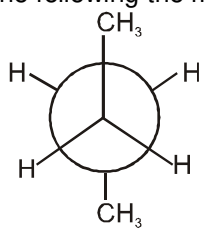
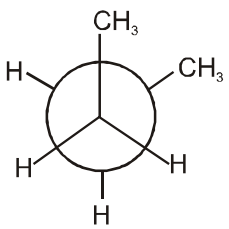
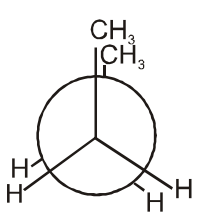
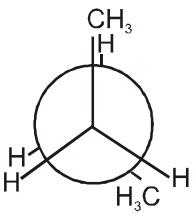
J-1. The eclipsed and staggered conformation of ethane is due to –
(A) Free rotation about C–C single bond (B) Restricted rotation about C–C single bond
(C) Absence of rotation about C–C bond (D) None of the above

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

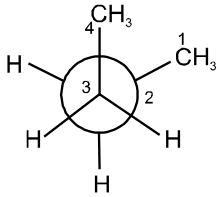
J-3. The Baeyer's angle strain is expected to be maximum in
(A) Cyclodecane (B) Cyclopentane (C) Cyclobutane (D) Cyclopropane

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 :

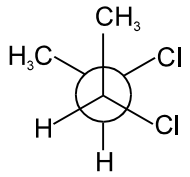
(A)  (B)  (C)  (D) 

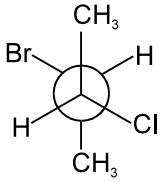
J-6. Newman projection of Butane is given, C-2 is rotated by 120º along C_2–C_3 bond in anticlockwise direction, the conformation formed is :

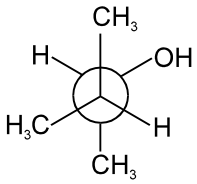


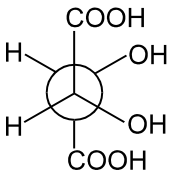
(A) anti (B) fully eclipsed (C) gauche (D) partially eclipsed

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

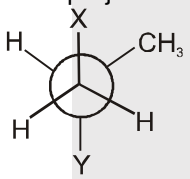
(A) 

(B) 

(C) 

(D) 

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



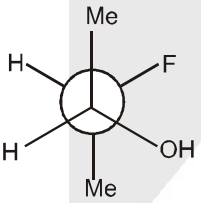
X,Y respectively can be :

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

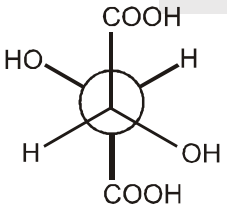
J-9. In 2-Fluoroethanol which conformer will be most stable ?

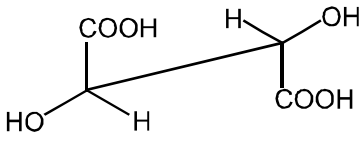
(A) Eclipsed (B) Skew (C) Gauche (D) Staggered

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

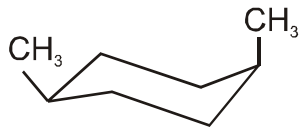
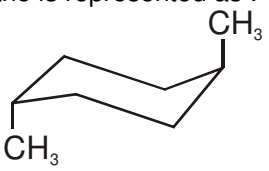
K-1. The least stable conformation of cyclohexane is

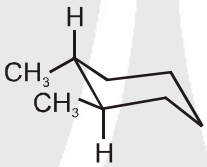
(A) Boat (B) Chair (C) Twist boat (D) Half chair

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

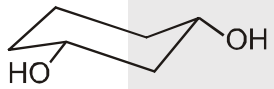
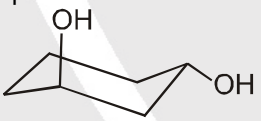
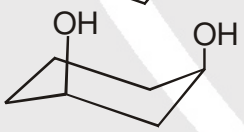
K-3. Chair form of cyclohexane is more stable than boat form because:
(A) In chair form carbons are in staggered form and in boat form carbons are in eclipsed form
(B) In chair form carbons are in eclipsed form and in boat form all the carbons are in staggered form
(C) Bond angle in chair form is 111° 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) 

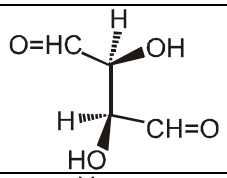
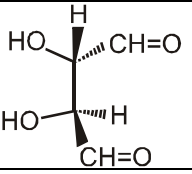
K-5. Geometry of the given compound  is:
(A) Cis
(B) Trans
(C) Cis and trans both
(D) No geometrical isomerism

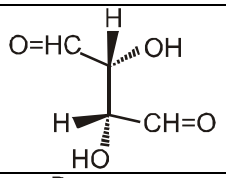
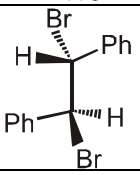
K-6. The most stable form of cis cyclohexane-1,3-diol is represented as :

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

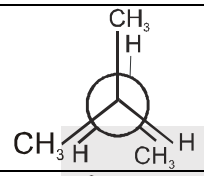
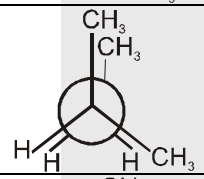
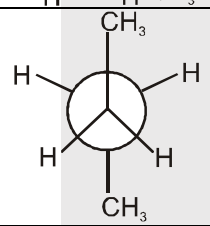
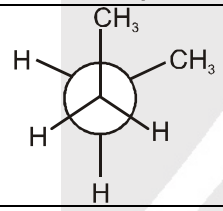
PART - III : MATCH THE COLUMN

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 :

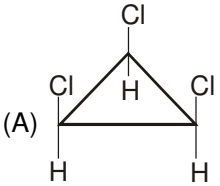
	Column-I		**Column-II**
(A)		(p)	Conformation with minimum vander-waal strain
(B)		(q)	Conformation with maximum vander waal strain
(C)		(r)	Conformation of maximum torsional strain
(D)		(s)	Conformation with minimum torsional strain

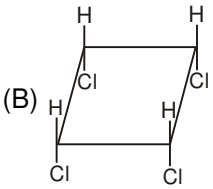
Exercise-2

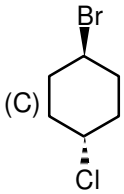
Marked questions are recommended for Revision.

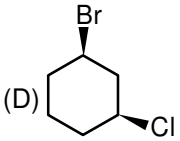
PART - I : ONLY ONE OPTION CORRECT TYPE

1. Which of the following molecule is chiral.

(A) 

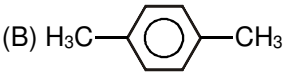
(B) 

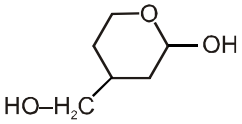
(C) 

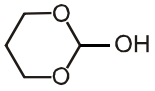
(D) 

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

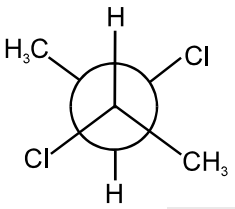
(A) 

(B) 

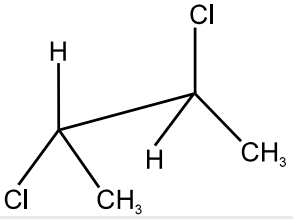
(C) 

(D) 

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



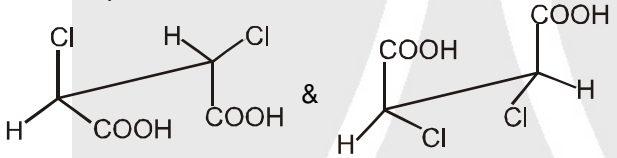
(a)



(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

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

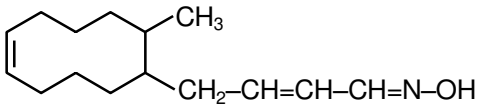
(A) $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-CH_3 \; + \; CH_3-\overset{\overset{O}{\|}}{C}-Ph$

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

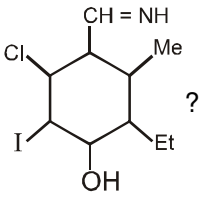
(C) $CH_2{=}O + CH_3CHO$

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

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

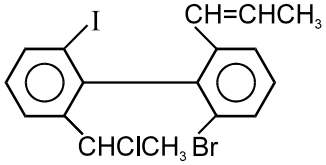


(A) 8 (B) 16 (C) 32 (D) 10

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

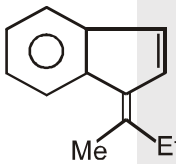
10. Number of conformational isomers of ethane.

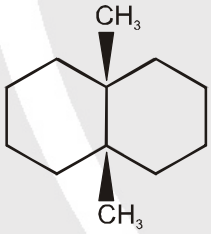
(A) 7 (B) 3 (C) 4 (D) Infinite

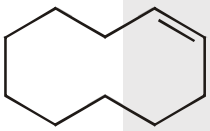
PART - II : SINGLE AND DOUBLE VALUE INTEGER TYPE

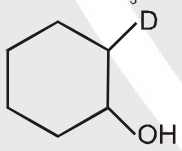
1. How many cyclic and acyclic structural isomers of C_5H_{10} can show geometrical isomerism?

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

(i) 

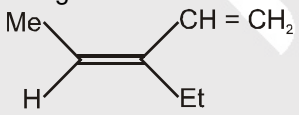
(ii) 

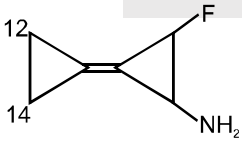
(iii) 

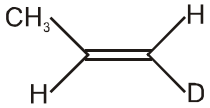
(iv) 

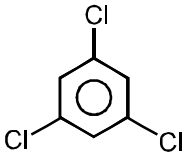
3. In given compounds how many have Z configuration along double bond ?

(i) 

(ii) 

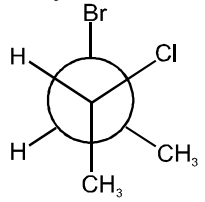
(iii) 

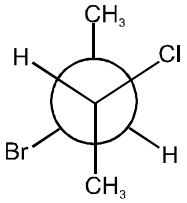
(iv) 

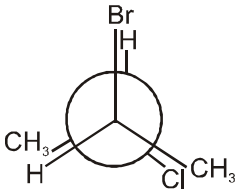
4.  Sum of C_2 & C_3 axis of symmetry is

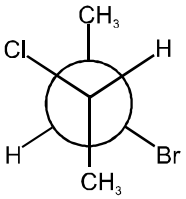
5. Optical rotaion data are expressed in standard way (specific rotation $[\alpha]_D$).
If magnituted of specific rotation of isomer d-lactic acid is 3.82. What will be the magnitude of specific rotation of acetic acid in degree.

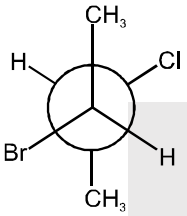
6. How many of the following are (configurational) enantionmers of (A) ?

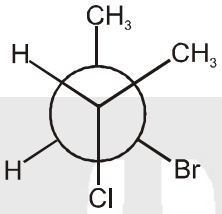
(A) = 

(p) 

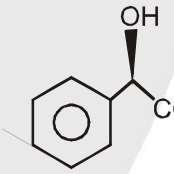
(q) 

(r) 

(s) 

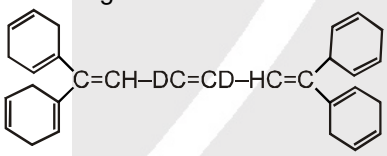
(t) 

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 :

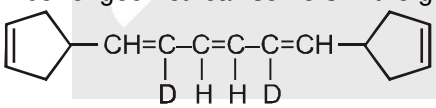
8. Pure (R) Mandelic acid 

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 :

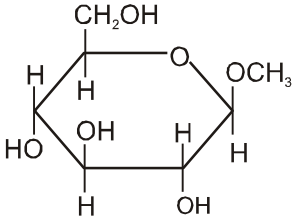


11. Total number of stereoisomers of compound $CH_3-CH=CH-\underset{\displaystyle Cl}{\underset{|}{CH}}-CH=CH-CH_3$ are :

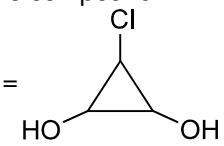
12. Total number of optically active stereoisomers of $CH_3-\underset{\displaystyle Cl}{\underset{|}{CH}}-CH=CH-\underset{\displaystyle Cl}{\underset{|}{CH}}-CH_3$ are :

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'

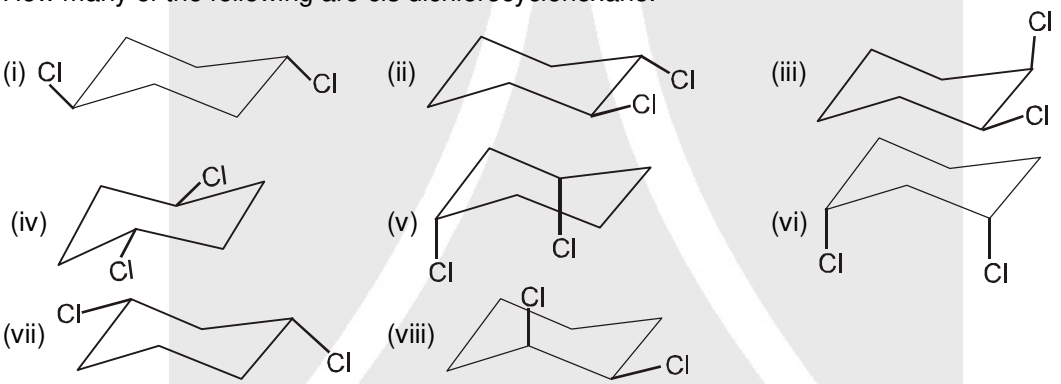
M = 

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

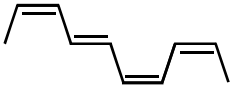
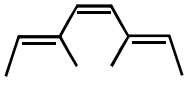
16. How many of the following are cis dichlorocyclohexane.



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 ?

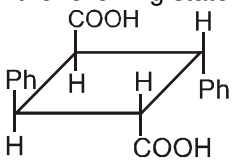
(A) 
(B) 
(C) 
(D) 

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 :

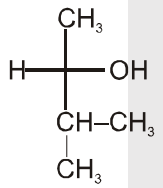


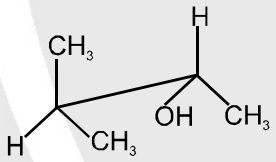
α-truxillic acid

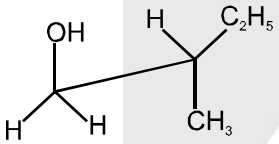
(A) It is a optically active compound
(B) It can show geometrical isomerism
(C) It posses centre of symmetry but not plane of symmetry
(D) It is a meso compound

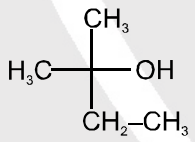
7. Find out correct statement/s.
(A) All chiral centers are stereogenic centers.
(B) All stereogenic centers are not chiral center.
(C) A compound may be chiral without chiral center.
(D) A compound will be chiral only if it has at least one chiral center.

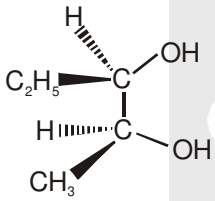
8. Which is/are not the structure of 3-Methyl butan-2-ol.

(A) 

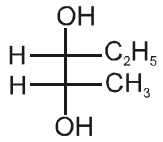
(B) 

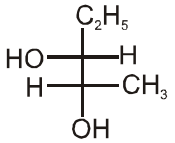
(C) 

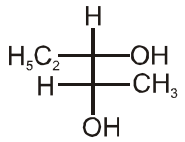
(D) 

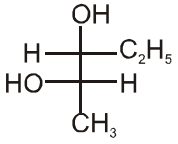
9. 

Fischer projection formula of this compound can be represented as :

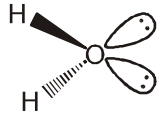
(A) 

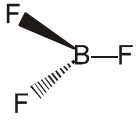
(B) 

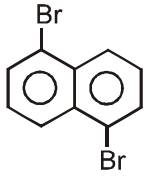
(C) 

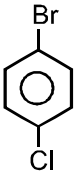
(D) 

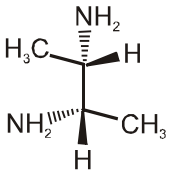
10. Which of the following compounds will have C_2 axis of symmetry ?

(A) 

(B) 

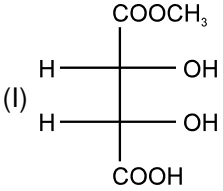
(C) 

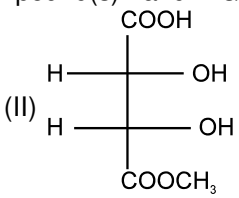
(D) 

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) 

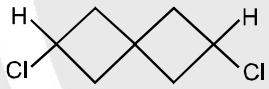
(II) 

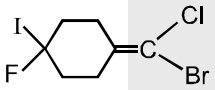
(A) identical.
(B) diastereomers
(C) enantiomers.
(D) configurational isomers

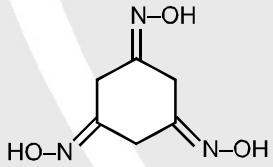
13. Enantiomers have
(A) Similar physical properties (generally).
(B) Similar chemical properties with optical active compounds.
(C) Same absolute value of specific rotation.
(D) Different configurations.

14. Which of the following will show geometrical isomerism?

(A) $CH_3–CH=C=C=CH–CH_3$

(B) 

(C) 

(D) 

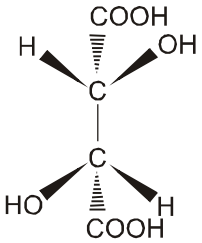
PART - IV : COMPREHENSION

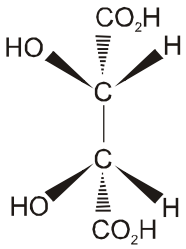
Read the following passage carefully and answer the questions.

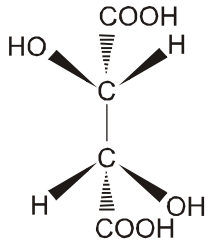
Comprehension # 1

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) 

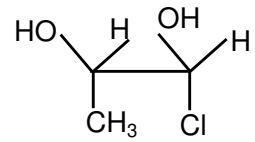
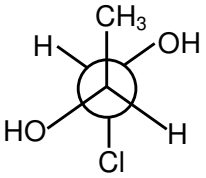
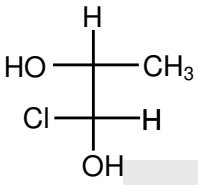
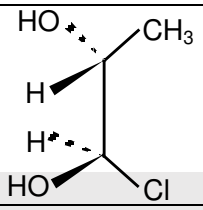
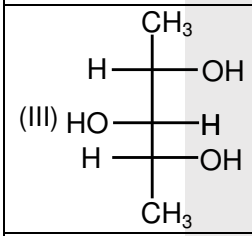
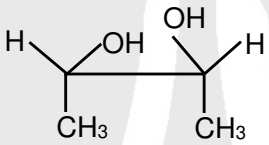
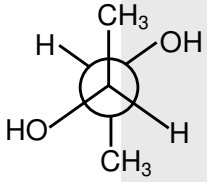
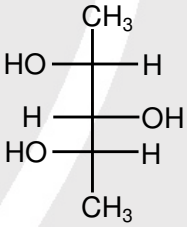
(D) none of these

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

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

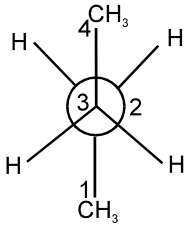
PART - I : JEE (ADVANCED) / IIT(JEE) PROBLEMS (PREVIOUS YEARS)

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, 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]**

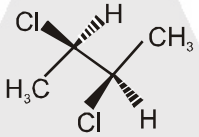
$\mu_{obs} = \Sigma\ \mu_i x_i$

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)

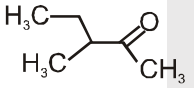
6. **Statement-1 :** Molecules that are not superimposable on their mirror images are chiral. because
Statement-2 : All chiral molecules have chiral centres. **[IIT(JEE)-2007, 3/162]**
(A) Statement-1 is true, statement-2 is true; statement-2 is a correct explanation for statement-1.
(B) Statement-1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

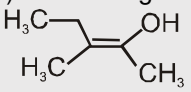


(A) The compound is optically active
(B) The compound possesses centre of symmetry
(C) The compound possesses plane of symmetry
(D) The compound possesses axis of symmetry

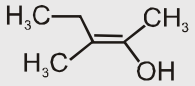
8.* The correct statements(s) concerning the structures E, F and G is (are): **[IIT(JEE)-2008, 4/163]**



(E)



(F)



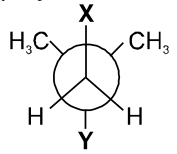
(G)

(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]**

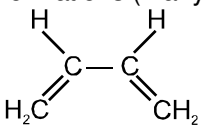
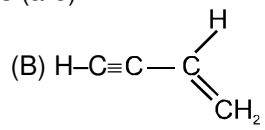
11.* In the Newman projection for 2, 2-Dimethylbutane



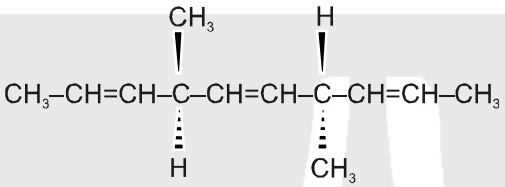
X and **Y** can respectively be : **[IIT(JEE) 2010, 3/163]**

(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) **[IIT(JEE) 2011, 4/180]**

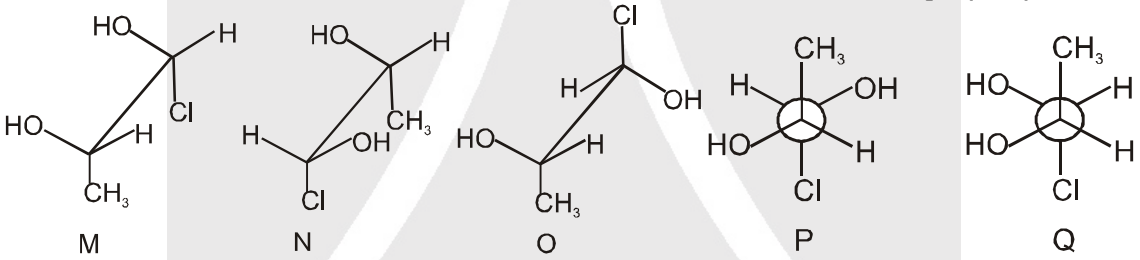
(A)  (B)  (C) $H_2C=C=O$ (D) $H_2C=C=CH_2$

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

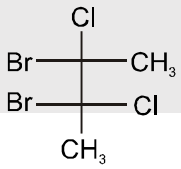
14.* Which of the given statement(s) about N, O, P and Q with respect to M is (are) correct ? **[IIT(JEE)-2012, 4/136]**



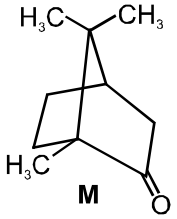
(A) M and N are non-mirror image stereoisomers (B) M and O are identical

(C) M and P are enantiomers (D) M and Q are identical

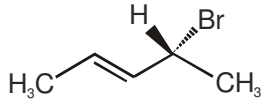
15. The total number(s) of **stable** conformers with non-zero dipole moment for the following compound is (are) : **[JEE(Advanced)-2014, 3/120]**

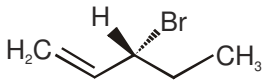


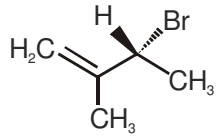
16. The total number of stereoisomers that can exist for **M** is **[JEE(Advanced)-2015, 4/168]**

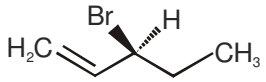


17.* Compound(s) that on hydrogenation produce(s) optically inactive compound(s) is (are)
[JEE(Advanced)-2015, 4/168]

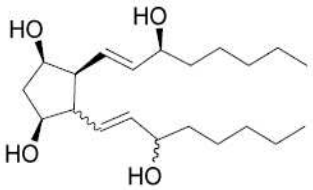
(A) 

(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

19. Total number of isomers considering both structural and stereoisomers, of cyclic ethers with the molecular formula C_4H_8O is_____ **[JEE(Advanced)-2019, 3/124]**

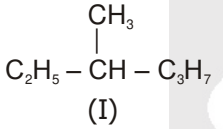
PART - II : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

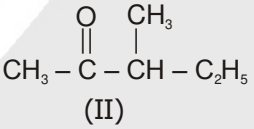
JEE-MAIN (OFFLINE) PROBLEMS

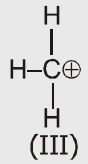
1. Racemic mixture is formed by mixing two : **[AIEEE 2002, 3/225]**
(1) Isomeric compounds (2) Chiral compounds
(3) Meso compounds (4) Optical isomers

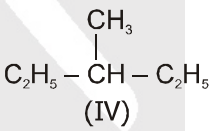
2. Which of the following does not show geometrical isomerism ? **[AIEEE 2002, 3/225]**
(1) 1,2-Dichloro-1-pentene (2) 1,3-Dichloro-2-pentene
(3) 1,1-Dichloro-1-pentene (4) 1,4-Dichloro-2-pentene

3. Among the following four structures I to IV.


(I)


(II)


(III)

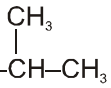

(IV)

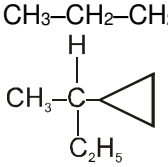
it is true that : **[AIEEE 2003, 3/225]**
(1) all four are chiral compounds (2) only I and II are chiral compounds
(3) only III is a chiral compound (4) only II and IV are chiral compounds

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

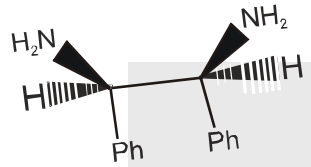
(3) geometric-isomerism (4) structural-isomerism

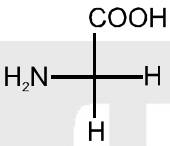
8. Increasing order of stability among the three main conformations (i.e. eclipse, anti, gauche) of 2-fluoroethanol is **[AIEEE- 2006, 3/165]**

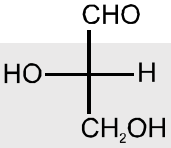
(1) eclipse, gauche, anti (2) gauche, eclipse, anti

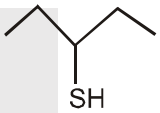
(3) eclipse, anti, gauche (4) anti, gauche, esclipse

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

(1) 

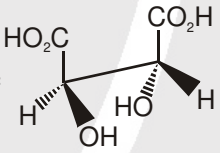
(2) 

(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

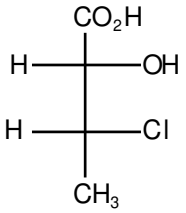
14. Out of the following, the alkene that exhibits optical isomerism is. **[AIEEE 2010, 4/144]**

(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]

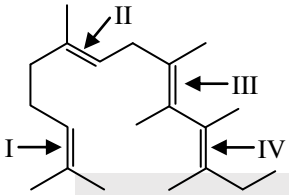
(1) Lactic acid (2) Tartaric acid (3) Maleic acid (4) α-amino acid

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

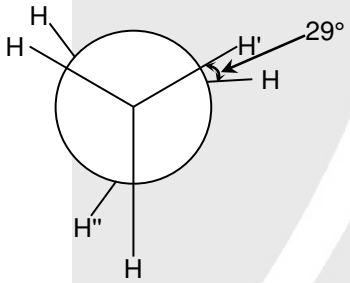


Geometrical isomerism is not possible at site (s) : **[JEE(Main) 2017 Online (09-04-17), 4/120]**

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

4. In the following skew conformation of ethane, H'–C–C–H'' dihedral angle is :

[JEE(Main) 2019 Online (12-04-19)S2, 4/120]



(1) 58° (2) 149° (3) 120° (4) 151°

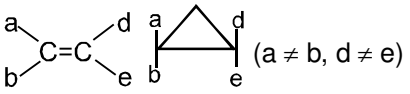
Answers

EXERCISE - 1

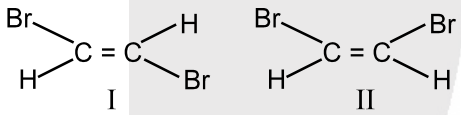
PART – I

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

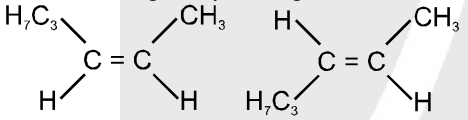
A-2. Essential conditions for geometrical isomerism are
(1) Restricted rotation must present.
(2) Two different groups must be present on both restricted atoms.
(3) Groups responsible to show geometrical isomerism must be nearly in the same plane.

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.  ($a \neq b, d \neq e$)

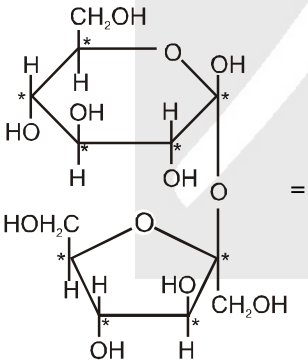
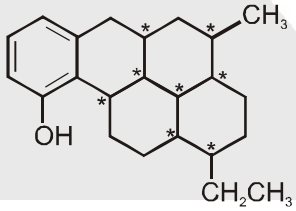
A-4. (iii), (iv), (vi), (vii) and (viii) **A-5.** 5 (i, ii, iv, v, vi) **B-1.** (i) = E, (ii) = E, (iii) = E, (iv) = Z

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

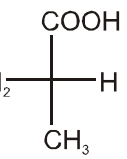
(b) Because of good packing of trans isomers.

(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

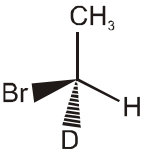
D-1. (I) R (II) S (III) R (IV) (R, R)

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

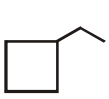
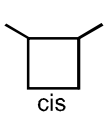
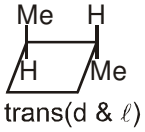
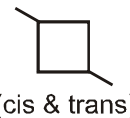
G-4. 4 **H-1.** i, ii, iii, iv **H-2.** ii, iii, v, vi **I-1.** (i) 3, (ii) 2, (iii) 2, (iv) 8

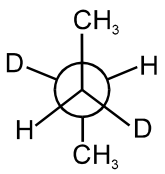
I-2. 3 (oct-2-ene, oct-3-ene, oct-4-ene)

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

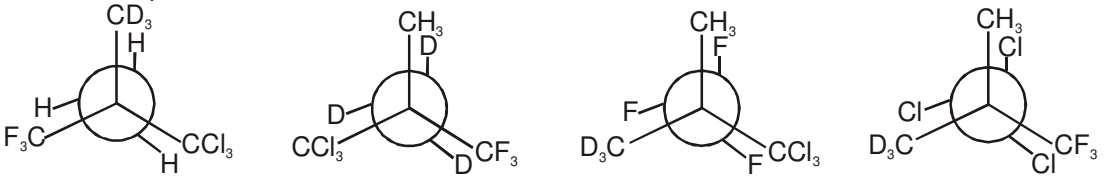
I-4. (I) $CH_3 - \overset{*}{C}H(OH) - CH = \overset{*}{C}H - CH_3$

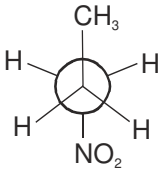
Number of stereocentres = 2 so total number of stereoisomers = $2^2 = 4$
(II) All 4 isomers are optically active.
(III) Total enantiomeric pairs are 2, hence number of fraction will be 2.

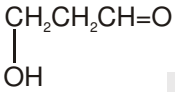
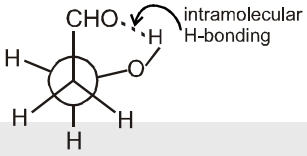
I-5. **T**otal=7   cis  trans(d & ℓ)   (cis & trans)

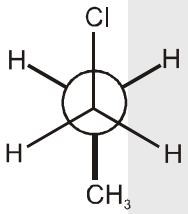
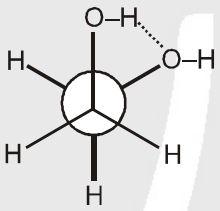
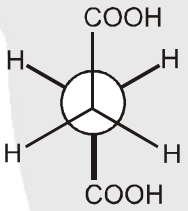
I-6. 6 **J-1.** Fully Eclipsed **J-2.** 

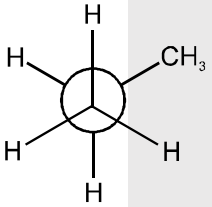
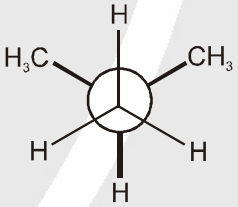
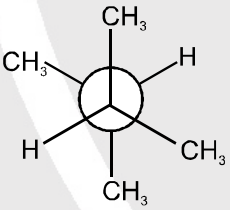
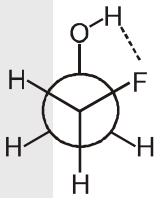
J-3. Possible eclipsed conformations = 4



J-4.  antiform, it is most polar & stable.

J-5.  ; 

J-6. (I)  (II)  (III) 

J-7. (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

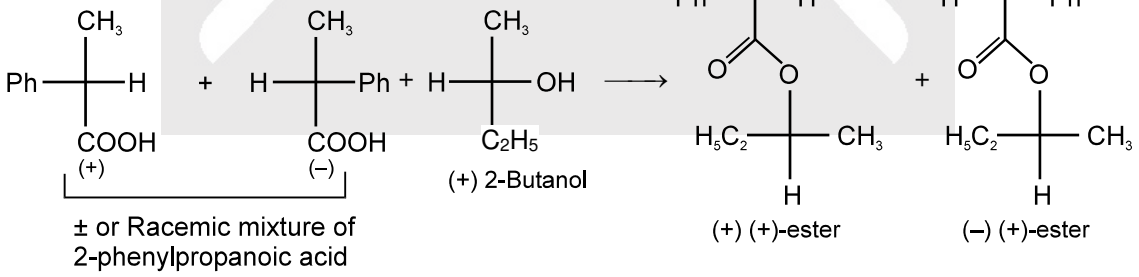
1.	(B)	**2.**	(C)	**3.**	(C)	**4.**	(D)	**5.**	(AC)

EXERCISE - 3

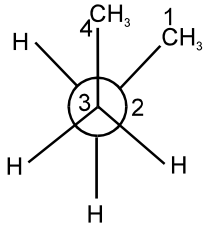
PART - I

1. (A)

2.



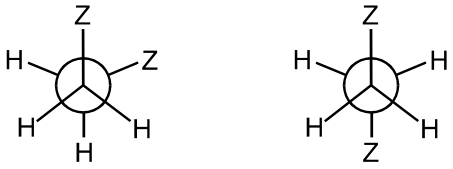
3. Least stable staggered form of n–butane is



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)

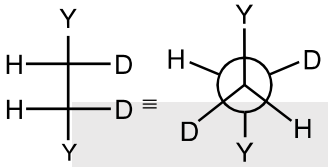
5.



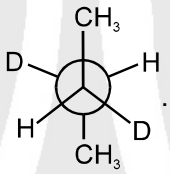
Gauche form
μ_{obs} = 1D

Anti form
x_{gauche} = 0.18

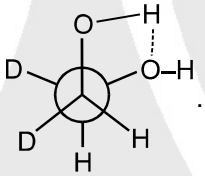
$\Rightarrow$ $\mu_{obs} = \Sigma\mu_i x_i$ $\Rightarrow$ $1 = \mu_{gauche} \times 0.18 + 0.82 \times 0$ $\Rightarrow$ $\mu_{gauche} = \frac{1}{0\ .\ 18} = 5.55$ D



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)	**19.**	(10.00)		

PART - II

JEE-MAIN (OFFLINE)

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)

1.	(3)	**2.**	(3)	**3.**	(1)	**4.**	(2)

Additional Problems for Self Practice (APSP)

Marked questions are recommended for Revision.

This Section is not meant for classroom discussion. It is being given to promote self-study and self testing amongst the Resonance students.

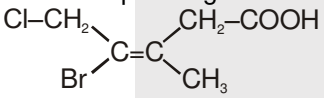
PART - I : PRACTICE TEST-1 (IIT-JEE (MAIN Pattern))

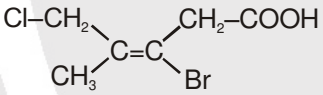
Max. Marks : 120 **Max. Time : 1 Hr.**

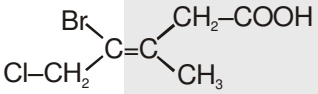
Important Instructions

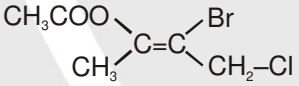
1. The test is of **1 hour** duration.
2. The Test Booklet consists of **30** questions. The maximum marks are **120.**
3. Each question is allotted **4 (four)** marks for correct response.
4. Candidates will be awarded marks as stated above in Instructions No. 3 for correct response of each question.
   ¼ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
5. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instructions 4 above.

1. Which is the pair of geometrical isomers :

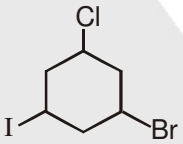
(i) 

(ii) 

(iii) 

(iv) 

(1) i & ii (2) i & iii (3) iii & iv (4) i & iv

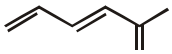
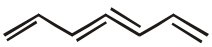
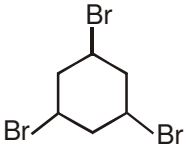
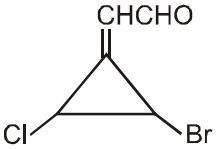
2. How many geometrical isomers are possible for  :

(1) 2 (2) 3 (3) 4 (4) 8

3. Which will not show geometrical isomerism ?

(1) Maleic acid (2) Fumaric acid (3) Cinnamic acid (4) Salicylic acid

4. Which of the following has highest number of geometrical isomers.

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

5. Total number of position isomers of trichlorocyclohexane which can show geometrical isomerism.

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

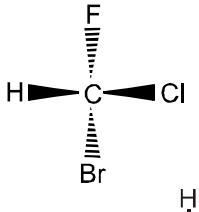
6. The total number of stereoisomers of 2,3-pentanediol are

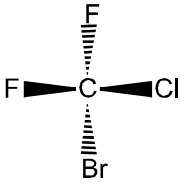
(1) four (2) two (3) six (4) three.

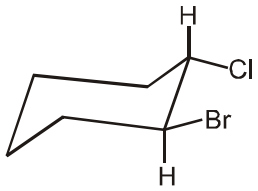
7. The most stable form of meso-tartaric acid is

(1) Gauche form (2) Anti form (3) Fully eclipsed form (4) Partially eclipsed

8. Which of the following molecules possess a plane of symmetry?

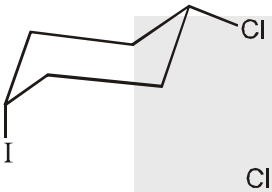
(1) 

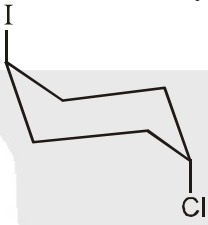
(2) 

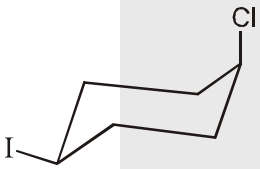
(3) 

(4) More than one of these

9. Select correct order of stability of different forms of 1-Chloro-4-iodo cyclohexane.

(I) 

(II) 

(III) 

(IV) 

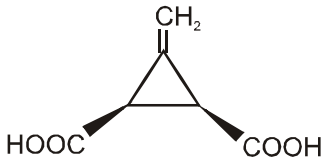
(1) IV > III > I > II (2) IV > I > III > II (3) III > II > I > IV (4) II > I > III > IV

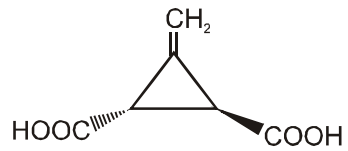
10. Which of the following statement is incorrect ?
(1) Diastereomers can be chiral.
(2) Diastereomers can be achiral.
(3) Enantiomers have similar physical and chemical properties always.
(4) Presence of plane of symmetry confirms optical inactivity.

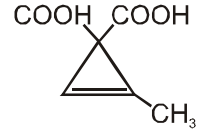
11. Which type of isomerism is shown by 2,3-Dichlorobutane?
(1) Tautomerism (2) Optical
(3) Geometrical (4) Functional isomerism

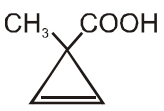
12. Increasing order of stability among the three main conformations of 2-Fluoroethanol is :
(1) Eclipse, Gauche, Anti (2) Gauche, Eclipse, Anti
(3) Eclipse, Anti, Gauche (4) Anti, Gauche, Eclipse

13. The unusually stable three membered unsaturated compound, Feist acid was found to be chiral in nature. Its structure is

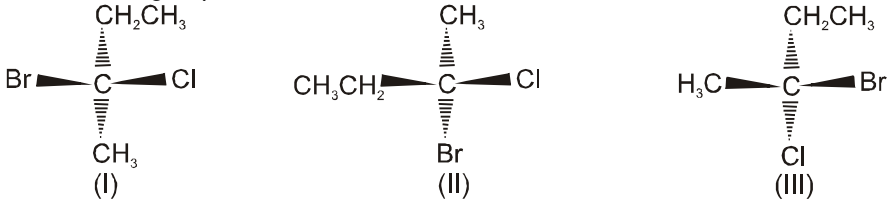
(1) 

(2) 

(3) 

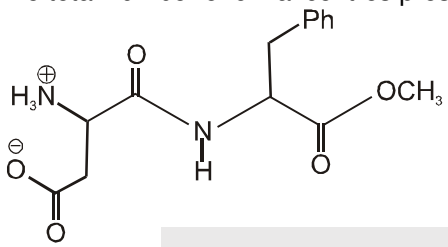
(4) 

14. Which of the following depict the same stereoisomer ?



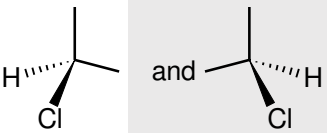
(1) I and II (2) I and III (3) II and III (4) I, II and III

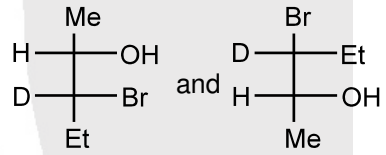
15. The total number of chiral centres present in the artificial sweetener Aspartam are

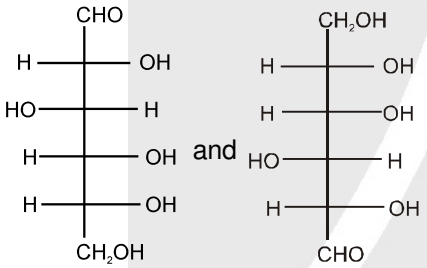


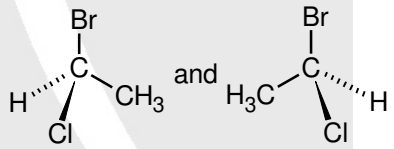
(1) 1 (2) 2 (3) 3 (4) 4

16. Which pair is identical ?

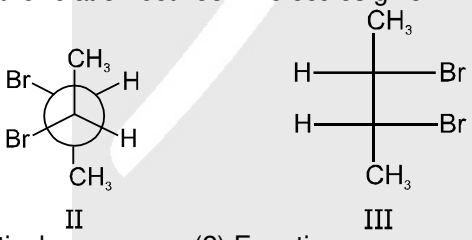
(1) 

(2) 

(3) 

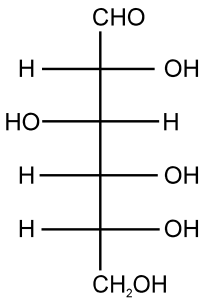
(4) 

17. Identify the relation between molecules given in Newman and Fischer projections.



(1) Identical (2) Enantiomers (3) Diastereomers (4) Conformers

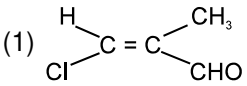
18. The correct IUPAC name of D-Glucose is :

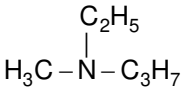


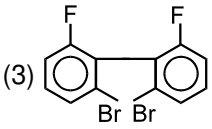
(D-Glucose)

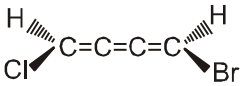
(1) (2D, 3D, 4L, 5D)-2, 3, 4, 5, 6-pentahydroxyhexanal (2) D-2, 3, 4, 5, 6-pentahydroxyhexanal
(3) 6-oxo-(2D, 3L, 4D, 5D)-2, 3, 4, 5, 6-pentahydroxohexane
(4) (2D, 3L, 4D, 5D)-2, 3, 4, 5, 6-pentahydroxyhexanal

19. Which of the following species will be optically active?

(1) 

(2) 

(3) 

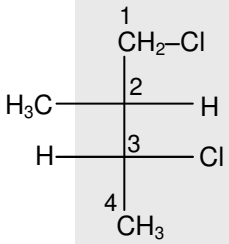
(4) 

20. Which of the following compounds exhibits stereoisomerism ?
(1) 2-methylbutene-1 (2) 3-methylbutyne-1
(3) 3-methylbutanoic acid (4) 2-methylbutanoic acid

21. In which of the following alcohol chiral carbon atom is present :
(1) n-pentyl alcohol (2) neopentyl alcohol (3) pentan-3-ol (4) pentan-2-ol

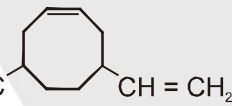
22. Which of the following conformer of n-Butane is associated with maximum potential energy.
(1) Gauch (2) partially eclipsed (3) Anti (4) Fully eclipsed

23. The R/S designation for the following stereoisomers of 1,3-dichloro-2-methylbutane is :



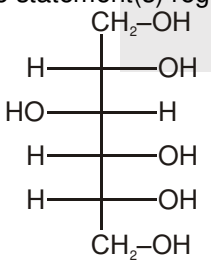
(1) 2S, 3R (2) 2S, 3S (3) 2R, 3S (4) 2R, 3R

24. Which of the following will not show geometrical isomerism ?

(1) $CH_3–N=N–CH=CH_2$
(2) 
(3) $CH_3–CH=N–OH$
(4) Cl–CH=C=CH–Cl

25. The racemic mixture in liquid/gaseous state will have
(1) Same boiling point as that of its pure enantiomer.
(2) Same refractive index as that of its pure enantiomer.
(3) Same density as that of its pure enantiomer.
(4) All of the above.

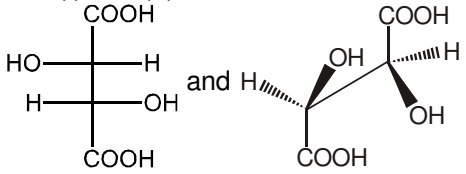
26. True statement(s) regarding the given molecule is /are :



(1) This is optically inactive.
(2) If the last chiral carbon configuration is changed then it is converted from dextro to laevo.
(3) By changing the configuration at C_3 or C_4 carbon, it is converted into meso compound.
(4) Its all diastereomers have zero optical rotation.

27. Most stable conformation of 1,4-Di(tert-butyl) cyclohexane is
(1) chair (2) Boat (3) Half chair (4) Twist boat

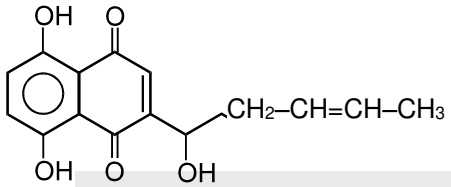
28. The two compounds (I) and (II) are related as :



(I) (II)

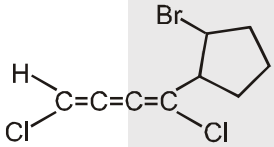
(1) Enantiomers (2) Anomers (3) Diastereomers (4) Identical

29. How many stereoisomers of a drug for healing the wounds are possible & how many of them are optically active?



(1) 4, 2 (2) 4, 4 (3) 8, 4 (4) 16, 4

30. Which of the following compounds is capable of showing geometircal, optical and conformational isomerism.

(1) 

(2) $H_2C = CH - CH - CH_3$ (OH)

(3) $CH_3–CH=CH–CH_2–CH_2–OH$

(4) $H_2C=CH–CH_2–OH$

Practice Test-1 (IIT-JEE (Main Pattern))

OBJECTIVE RESPONSE SHEET (ORS)

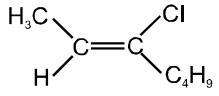
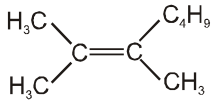
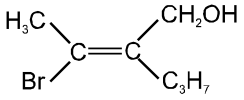
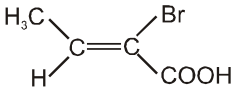
Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22	23	24	25	26	27	28	29	30
Ans.										

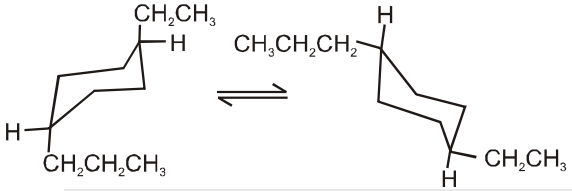
PART - II : NATIONAL STANDARD EXAMINATION IN CHEMISTRY (NSEC)STAGE-I

1. Which of the following is a chiral molecule ? **[NSEC-2000]**
(A) 2,4-dimethyl-1,3-hexadiene (B) 2,4-octadiene
(C) 2,3-octadiene (D) None of these

2. Which of the following has the highest potential energy for pentane ? **[NSEC-2000]**
(A) anti conformation (B) eclipsed conformation
(C) gauche conformation (D) all have same potential energy

3. Which of the following does not exist as geometric isomers ? **[NSEC-2000]**
(A) 3-bromo-2-methyl-2-butene (B) cyclodecene
(C) 3-bromo-1-Chloro-1-pentene (D) 3-methyl-2-pentene

4. Which of the following is an E isomer ? **[NSEC-2000]**
(A)  (B)  (C)  (D) 

5. Consider the following equilibrium,

Which of the following best describes the equilibrium constant K of this interconversion ? **[NSEC-2000]**
(A) K < 1 (B) K > 1
(C) K = 1 (D) K cannot be deduced from this information

6. Which of the following best describes the stability of the cis and trans isomers of 1, 1, 3, 5 tetraethylcyclohexan ? **[NSEC-2000]**
(A) The trans isomer is more stable than the cis.
(B) The cis isomer is more stable than the trans.
(C) Both have the same stability
(D) The information given is not sufficient to deduce the stability of the isomers.

7. Which of the following has the greatest angle strain ? **[NSEC-2000]**
(A) methyl cyclobutane (B) methyl cyclopentane
(C) methyl cyclohexane (D) methyl cyclopropane

8. Which would be the most stable conformation of trans-1- ethyl-3-methylcyclohexane? **[NSEC-2000, 01]**
(A) equatorial (methyl)-equatorial (ethyl) (B) axial (methyl)-equatorial (ethyl)
(C) axial (methyl)-axial (ethyl) (D) axial (ethyl)-equatorial (methyl)

9. The method used to distinguish optical isomers is **[NSEC-2000]**
(A) polarimetry (B) spectroscopy
(C) chemical analysis (D) boiling point determination

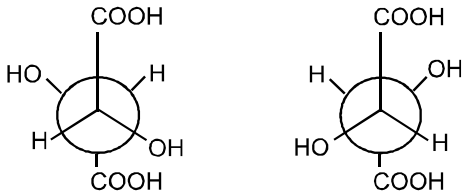
10. Isomers which can be interconverted through rotation around a single bond are : **[NSEC-2001]**
(A) enantiomers (B) diastereomers (C) conformers (D) positional isomers

11. Which of the following will have least hindered rotation about carbon-carbon bond ? **[NSEC-2001]**
(A) ethylene (B) hexachloroethane (C) ethane (D) acetylene

12. In cis-trans isomerism, the compound generally **[NSEC-2002]**
(A) contains a triple bond (B) contains a double bond
(C) possesses an asymmetric carbon atom (D) rotates the plane of polarized light.

13. The number of optical isomers for a compound having two similar asymmetric carbon atoms in the molecule is given as **[NSEC-2002]**
(A) 2 (B) 2^2 (C) $> 2^2$ (D) $< 2^2$

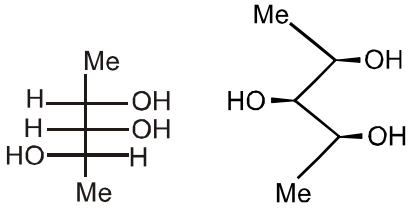
14. Optical activity of a substance is due to **[NSEC-2002]**
(A) presence of aldehyde group (B) high molecular weight
(C) chemical reactivity (D) presence of an asymmetric carbon atom

15. 

The above pair represents **[NSEC-2003]**

(A) enantiomers (B) diastereomers (C) identical compounds (D) positional isomers.

16. The following stereoisomers are **[NSEC-2004]**



(A) enantiomers (B) epimers (C) diastereomers (D) none of these.

17. The compound that has the highest dipole moment is **[NSEC-2004]**

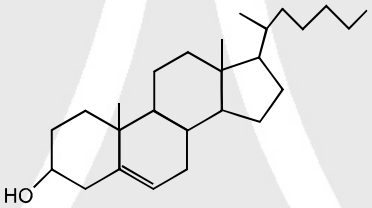
(A) cis-1,2-dichloroethene (B) trans-1,2-dichloroethene

(C) cis-1-bromo -2-chloroethene (D) trans-1-bromo-2-chloroethene.

18. How many optically active stereoisomers are possible for Butane-2,3-diol ? **[NSEC-2004]**

(A) 1 (B) 2 (C) 3 (D7) 4.

19. The number of theoretically possible stereoisomers in the following steroid is **[NSEC-2005]**



(A) 256 (B) 64 (C) 8 (D) 16.

20. The diastereomeric pair in the following four pairs of compounds is **[NSEC-2005]**

(A) 

(B) 

(C) 

(D) 

21. The compound that will not be able to exhibit stereoisomerism is : **[NSEC-2006]**

(A) 1,2-Dibromocyclopropane (B) Lactic acid

(C) 1-Bromopropene (D) 1-Methylcyclopropane.

22. The total number of stereoisomers of 2,3-butanediol are **[NSEC-2006]**

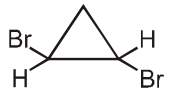
(A) four (B) two (C) six (D) three.

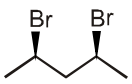
23. A compound is chiral even if **[NSEC-2006]**

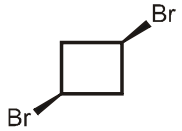
(A) a mirror plane is present (B) a centre of inversion exists

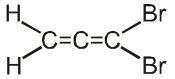
(C) a rotation axis exists (D) an improper rotation axis is present.

24. Identify the chiral species among the following : **[NSEC-2007]**

(A) 

(B) 

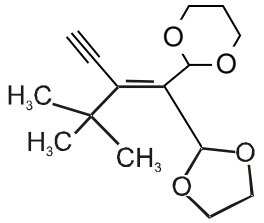
(C) 

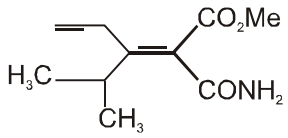
(D) 

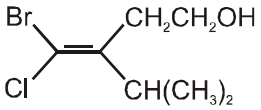
25. The achiral species among the following is : **[NSEC-2007]**

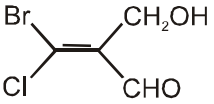
(A) a car (B) a screw driver (C) a screw (D) a hand

26. Which one of the following compounds has (Z) configuration about the C–C double bond? **[NSEC-2007]**

(A) 

(B) 

(C) 

(D) 

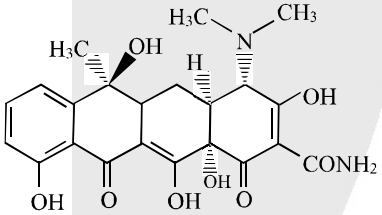
27. The following symmetry element is present in the 'd' as will as the 'ℓ' form of Tartaric acid [$CO_2HCH(OH)\ CH(OH)CO_2H$] **[NSEC-2007]**

(A) centre of symmetry (B) axis of symmetry (C_2)
(C) plane of symmetry (D) None

28. Conformational changes in a molecule leads to change in **[NSEC-2007]**

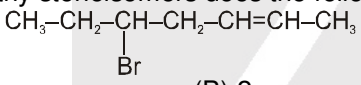
(A) torsional angle (B) bond angle (C) bond length (D) all of the above

29. How many chiral carbon atoms does Tetrachycline A (a broad spectrum antibiotic) have ? **[NSEC-2008]**


Tetracycline A

(A) 3 (B) 4 (C) 5 (D) 6

30. How many sterioisomers does the following compound have ? **[NSEC-2008]**

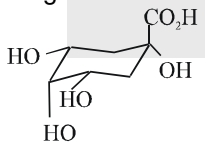


(A) None (B) 2 (C) 4 (D) 6

31. For cyclohexane, which of the following factors does not make the boat conformation less stable than the chair conformation **[NSEC-2008]**

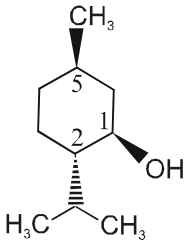
(A) 1,3-diaxial interactions (B) flag pole interactions
(C) angle strain (D) torsional strain

32. The following molecule has a **[NSEC-2008]**



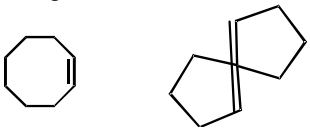
(A) centre of symmetry (B) plane of symmetry (C) axis of symmetry (D) none of the above

33. The absolute configurations of the chiral centres 1, 2 and 5 in the following molecule are **[NSEC-2008]**



(A) 1R, 2R, 5R (B) 1S, 2S, 5S (C) 1R, 2S, 5R (D) 1S, 2R, 5S

34. The following structures are **[NSEC-2008]**

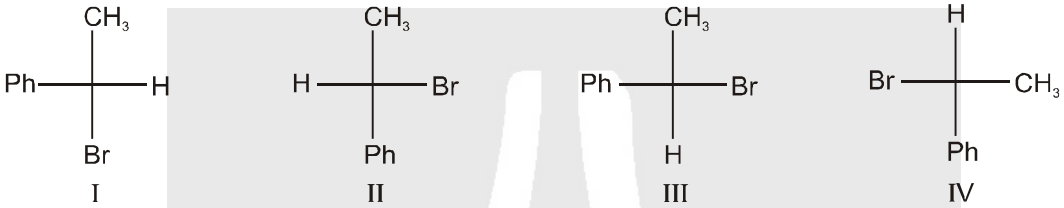


(A) enantiomers (B) identical (C) diastereomers (D) rotamers

35. The isomeric alcohol which has a chiral carbon atom is : **[NSEC-2009]**
(A) n-butyl alcohol (B) iso-butyl alcohol (C) sec-butyl alcohol (D) tert-butyl alcohol

36. Geometrical isomerism results because the molecule : **[NSEC-2009]**
(A) rotates the plane of polarized light
(B) has a plane of symmetry
(C) has a centre of symmetry
(D) has two dissimilar groups attached to both ends of double bond.

37. The pair of enantiomers among the following compound are : **[NSEC-2009]**

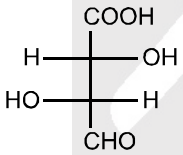


(A) I and IV (B) II and IV (C) II and III (D) I and II

38. The number of all types of isomers of chlorobutane is **[NSEC-2010]**
(A) 2 (B) 4 (C) 6 (D) 5

39. (i) $CH_2=CH-CH_2-CH=CH_2$
(ii) $CH_2=CH-CH=CH-CH_3$
(iii) $CH_3-CH=CH-CH=CH-CH_3$
The numbers of possible geometrical isomers for the above compounds respectively are **[NSEC-2010]**
(A) 0,2,4 (B) 2,2,4 (C) 0,3,3 (D) 0,2,3

40. The configurations of the carbon atoms C_2 and C_3 in the following compound are respectively. **[NSEC-2011]**

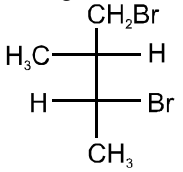


(A) R, R (B) S, S (C) R, S (D) S, R

41. The compound that is chiral. **[NSEC-2011]**
(A) 3-Methyl-3-hexene (B) 1-Chloro-4-methylcyclohexane
(C) 2-Phenylpentane (D) 1,3-Diisopropylbenzene

42. The number of stereoisomers of compound $CH_3-CH=CH-CH(Br)CH_3$ is : **[NSEC-2011]**
(A) 2 (B) 3 (C) 4 (D) 6

43. The **R/S** designation for the following stereoisomer of 1,3-Dibromo-2-methylbutane is : **[NSEC-2012]**

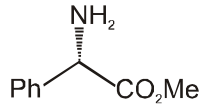


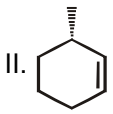
(A) 2R, 3R (B) 2R, 3S (C) 2S, 3R (D) 2S, 3S

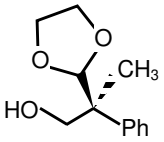
44. Among the isomers of Dimethylcyclohexanes, the chiral ones are **[NSEC-2012]**

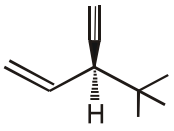
(A) 1, 2-trans and1, 3-cis (B) 1, 2-cis and 1,3-trans
(C) 1, 3-trans and 1, 4-trans (D) 1, 2-trans and 1,3-trans

45. Which one of the following compound has R configuration? **[NSEC-2012]**

I. 

II. 

III. 

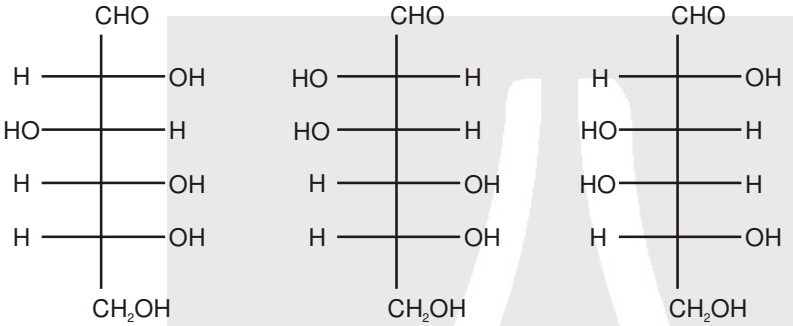
IV. 

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

46. The number of optically active stereoisomers of tartaric acid, (HOOC.CHOH.CHOH.COOH) is **[NSEC-2013]**

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

47.



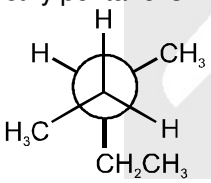
The above structures are related to each other as **[NSEC-2013]**

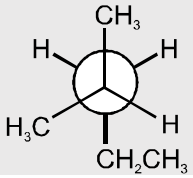
(A) identical substance (B) diastereomers (C) enantiomers (D) epimers

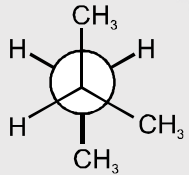
48. Which of the following molecules cannot show geometric isomerism ? **[NSEC-2013]**

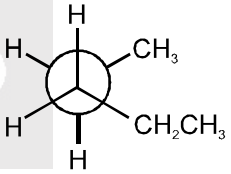
(A) $CH_3CH{=}NOH$ (B) $(CH_3)_2C{=}NOH$ (C) HO–N=N–OH (D) 

49. 2-methylpentane is : **[NSEC-2014]**

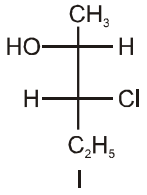
(A) 

(B) 

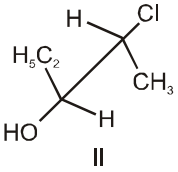
(C) 

(D) 

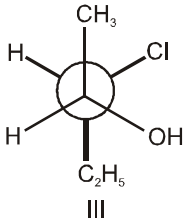
50. The two projection formulae that represent a pair of enantiomers are. **[NSEC-2015]**



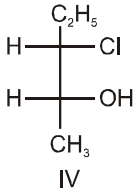
I



II



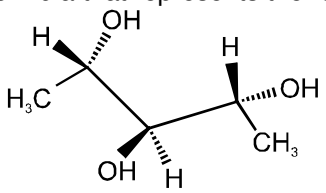
III

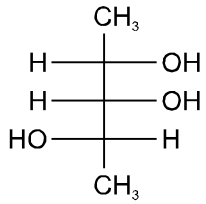


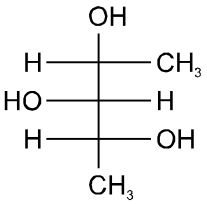
IV

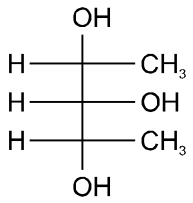
(A) I and II (B) III and IV (C) I and III (D) II and IV

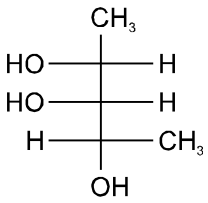
51. The Fischer projection formula that represents the following compounds is **[NSEC-2015]**



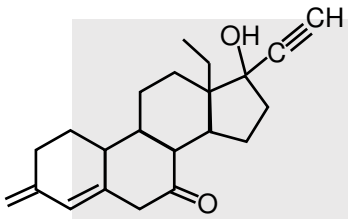
(A) 

(B) 

(C) 

(D) 

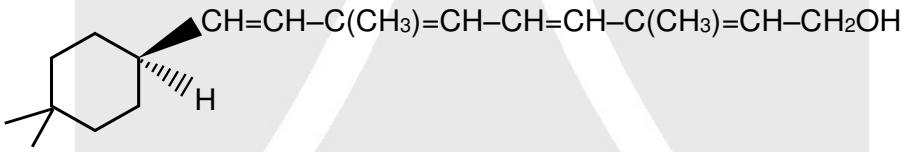
52. Levonorgestrel is a commonly used contraceptive. The number of chiral centres present in this molecule is : **[NSEC-2017]**



Levonorgestrel

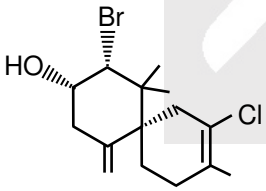
(A) 4 (B) 5 (C) 6 (D) 7

53. The number of stereoisomers possible for the following compound. **[NSEC-2018]**



(A) 4 (B) 2 (C) 16 (D) 32

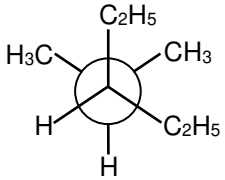
54. The number of quaternary and chiral carbon atoms present in elatol, isolated from an algae are respectively **[NSEC-2018]**

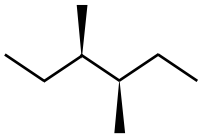


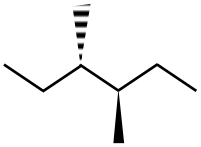
Elatol

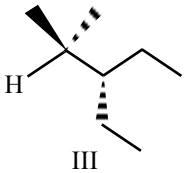
(A) 2, 3 (B) 4, 2 (C) 3, 2 (D) 1, 3

55. The Newman projection shown is the same as **[NSEC-2018]**

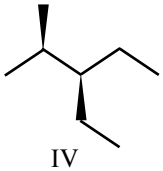



I


II

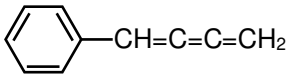
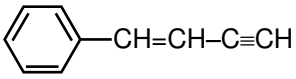


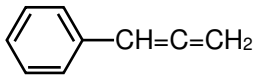
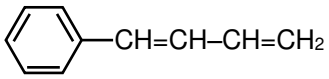
III


IV

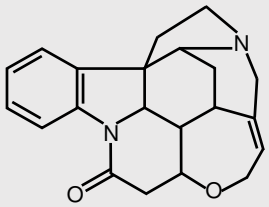
(A) I and IV (B) II and III (C) III and IV (D) I and II

56. The molecule in which all atoms are not coplanar is **[NSEC-2018]**

(A)  (B) 

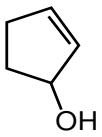
(C)  (D) 

57. The number of asymmetric carbon atoms in strychnine, whose structure given below is **[NSEC-2019]**

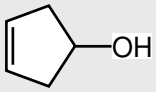


(A) 5 (B) 4 (C) 6 (D) 7

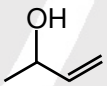
58. Which of the following compounds have chiral carbon atom/s ? **[NSEC-2019]**



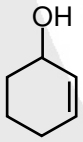
I



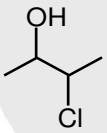
II



III



IV



V

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

PART - III : PRACTICE TEST-2 (IIT-JEE (ADVANCED Pattern))

Max. Time : 1 Hr. **Max. Marks : 69**

Important Instructions

A. General :

1. The test is of 1 hour duration.
2. The Test Booklet consists of 23 questions. The maximum marks are 69.

B. Question Paper Format :

3. Each part consists of five sections.
4. Section 1 contains 8 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE is correct.
5. Section 2 contains 6 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE OR MORE THAN ONE are correct.
6. Section 3 contains 6 questions. The answer to each of the questions is a single-digit integer, ranging from 0 to 9 (both inclusive).
7. Section 4 contains 1 paragraphs each describing theory, experiment and data etc. 2 questions relate to paragraph. Each question pertaining to a partcular passage should have only one correct answer among the four given choices (A), (B), (C) and (D).

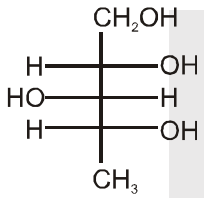
8. Section 5 contains 1 multiple choice questions. Question has two lists (list-1 : P, Q, R and S; List-2 : 1, 2, 3 and 4). The options for the correct match are provided as (A), (B), (C) and (D) out of which ONLY ONE is correct.

C. Marking Scheme :

9. For each question in Section 1, 4 and 5 you will be awarded 3 marks if you darken the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, minus one (– 1) mark will be awarded.
10. For each question in Section 2, you will be awarded 3 marks. If you darken all the bubble(s) corresponding to the correct answer(s) and zero mark. If no bubbles are darkened. No negative marks will be answered for incorrect answer in this section.
11. For each question in Section 3, you will be awarded 3 marks if you darken only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. No negative marks will be awarded for incorrect answer in this section.

SECTION-1 : (Only One option correct Type)

This section contains 8 multiple choice questions. Each questions has four choices (A), (B), (C) and (D) out of which Only ONE option is correct.

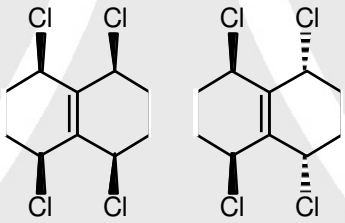
1.  is a Fischer projection of one of_____stereoisomers?

(A) 2 (B) 4 (C) 8 (D) 12

2. Which of the following has maximum number of two-fold axis of symmetry.

(A) Ethylene (B) Cyclopropane (C) Cyclobutane (D) Benzene

3. The following compounds are :



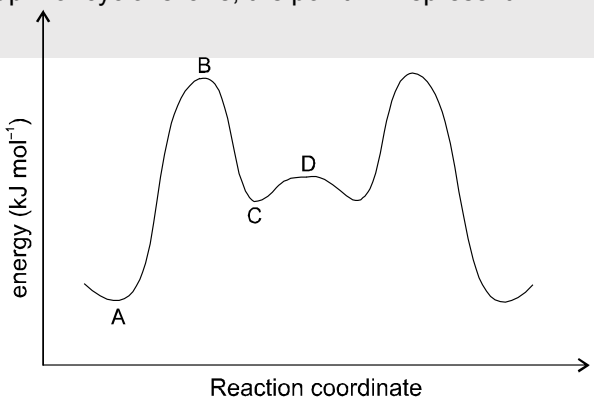
(I) (II)

(A) Enantiomer (B) Identical (C) Diastereomer (D) Geometrical isomer

4. Which conformation of Bicyclo [2, 2, 2]-octane is more stable ?

(A) Chair (B) Half Boat (C) Boat (D) Twisted boat

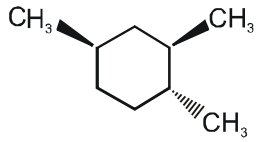
5. In the given energy graph for cyclohexane, the point "B" represent.

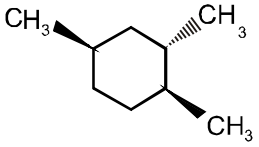


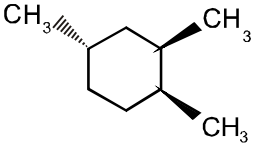
(A) Chair conformation (B) Half chair conformation

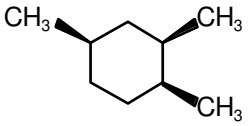
(C) Twist boat conformation (D) Boat conformation

6. Identify the most stable stereoisomer :

(A) 

(B) 

(C) 

(D) 

7. Molecular formula of smallest ester which contain one chiral carbon is :

(A) $C_4H_8O_2$ (B) $C_5H_{12}O$ (C) $C_6H_{12}O_2$ (D) $C_5H_{10}O_2$

8. Which of the following has/have potential energy diagram for conformations closely resembling to ethane.

(I) 2,2-Dimethylpropane (II) 2,3-Dimethylbutane

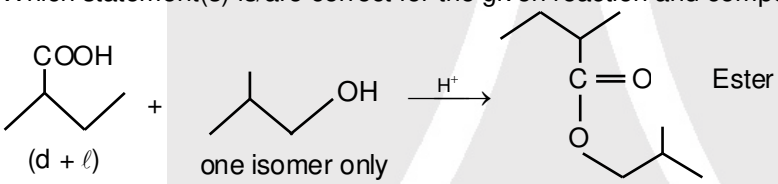
(III) 2,2,3-Trimethylbutane (IV) 2,2-Dimethylbutane

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

Section-2 : (One or More than one options correct Type)

This section contains 6 multiple choice questions. Each questions has four choices (A), (B), (C) and (D) out of which ONE or MORE THAN ONE are correct.

9. Which statement(s) is/are correct for the given reaction and compounds.



(A) Two esters are formed. (B) All the esters are chiral.

(C) Both esters are diastereomers. (D) Racemic mixture is formed as a product.

10. Intra-molecular H-bonding is possible in which of the following.

(A) cis-cyclohexane-1,2-diol (B) trans-cyclohexane-1,2-diol

(C) cis-cyclohexane-1,3-diol (D) cis-cyclohexane-1,4-diol

11. Which of the following statement(s) is/are correct?

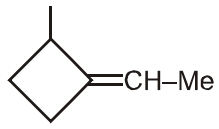
(A) Anti conformation of $H_2N–CH_2–CH_2–NH_2$ is more stable than its Gauche confromation.

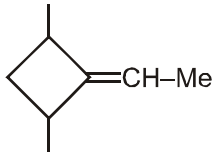
(B) Gauche conformation of $HO–CH_2–CH_2F$ is more stable than its anti conformation at room temperature.

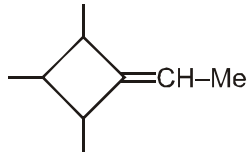
(C) On increasing temperature, dipole moment of pure $F–CH_2–CH_2–F$ increases.

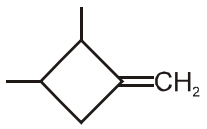
(D) In case of 1,4-Dihydroxycyclohaxane chair conformer is most stable.

12. Which of the following compounds can show Optical isomerism as well as geometrical isomerism?

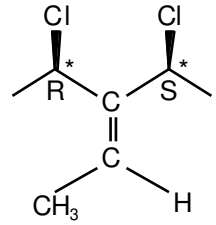
(A) 

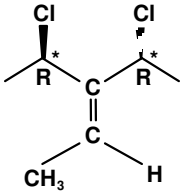
(B) 

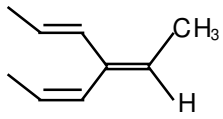
(C) 

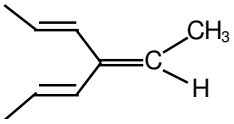
(D) 

13. Which of the following compounds can show geometrical isomerism.

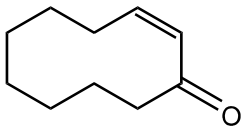
(A) 

(B) 

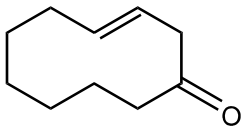
(C) 

(D) 

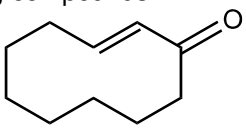
14. Which of the following statement(s) is/are true about the following compounds?



(I)



(II)



(III)

(A) (I) and (III) are identical (B) (I) and (III) are geometrical diastereomers
(C) (I) and (II) are structural isomers. (D) (II) and (III) are structural isomers.

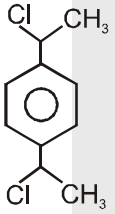
Section-3 : (Single/ Double Integer Value Correct Type.)

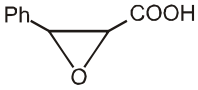
This section contains 6 questions. Each question, when worked out will result in one integer from 0 to 9 (both inclusive)

15. An organic compound P exists in two enantiomeric forms, which have specific optical rotation values [α] = ±100°. The optical rotation of a mixture of these two enantiomers is –50°. Calculate the percentage of that enantiomer which is in lower concentration in the mixture.

16. Total number of meso forms possible for 1,2,3,4-Tetrachlorocyclobutane.

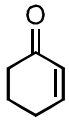
17. If "A" is total number of meso compounds and "B" is total number of optically active isomers; then find (A+B) for

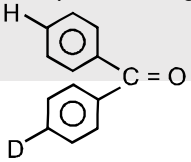


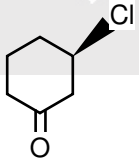
18. Sum of total no. of stereoisomers (A) and total no. of fractions (B) for the compound 

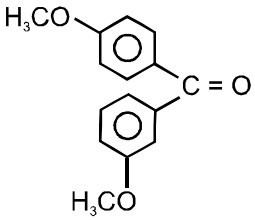
is.

19. How many of the following carbonyl compound will give two products after reaction with NH_2OH :

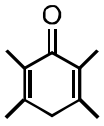
(i) 

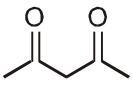
(ii) 

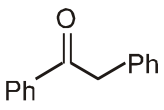
(iii) 

(iv) 

(v) 

(vi) 

(vii) 

(viii) 

(ix) $CH_3–CH=O$

20. Total number of stereoisomers of truxillic acid are :

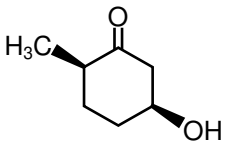
SECTION-4 : Comprehension Type (Only One options correct)

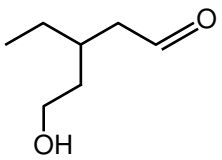
This section contains 1 paragraphs, each describing theory, experiments, data etc. 2 questions relate to the paragraph. Each question has only one correct answer among the four given options (A), (B), (C) and (D)

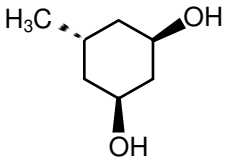
Paragraph for Questions 21 to 22

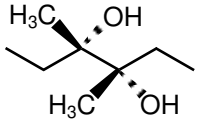
An unknown substance (P) shows optical activity. This optical activity disappears on treatment of (P) with acidified $KMnO_4$ (which produces Q), or with heated copper (which produces R). (P) Produces silver mirror with Tollen's reagent, thereby producing (S). (S) is chiral. Based on this information, answer the following questions :

21. (P) may be -

(A) 

(B) 

(C) 

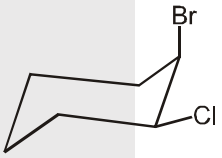
(D) 

22. Number of stereoisomers possible for (P) is –

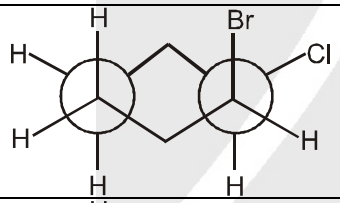
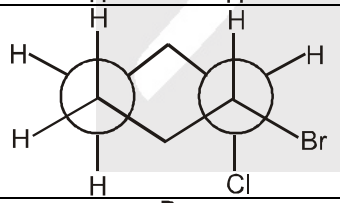
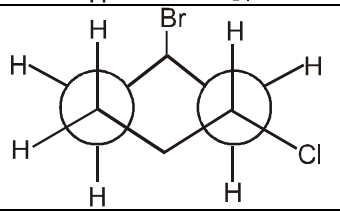
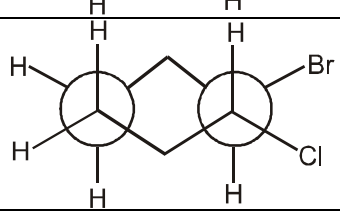
(A) 2 (B) 3 (C) 4 (D) 8

SECTION-5 : Matching List Type (Only One options correct)

This section contains 1 questions, each having two matching lists. Choices for the correct combination of elements from List-I and List-II are given as options (A), (B), (C) and (D) out of which one is correct.

23. Match the compounds of **Column-I** with their relationship with 

mentioned in **Column-II.**

	Column-I		Column-II
P.		1.	Geometrical isomer
Q.		2.	Conformation
R.		3.	Positional isomer
S.		4.	Identical

Code:

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

Practice Test-2 ((IIT-JEE (ADVANCED Pattern))

OBJECTIVE RESPONSE SHEET (ORS)

Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22	23							

APSP Answers

PART – I

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

PART – II

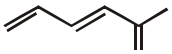
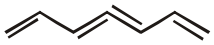
1.	(C)	**2.**	(B)	**3.**	(A)	**4.**	(C)	**5.**	(B)
6.	(B)	**7.**	(D)	**8.**	(B)	**9.**	(A)	**10.**	(C)
11.	(C)	**12.**	(B)	**13.**	(D)	**14.**	(D)	**15.**	(C)
16.	(C)	**17.**	(A)	**18.**	(B)	**19.**	(A)	**20.**	(B)
21.	(D)	**22.**	(D)	**23.**	(C)	**24.**	(A)	**25.**	(B)
26.	(B)	**27.**	(B)	**28.**	(A)	**29.**	(C)	**30.**	(C)
31.	(A)	**32.**	(B)	**33.**	(C)	**34.**	(C)	**35.**	(C)
36.	(D)	**37.**	(C)	**38.**	(D)	**39.**	(D)	**40.**	(A)
41.	(C)	**42.**	(C)	**43.**	(A)	**44.**	(D)	**45.**	(D)
46.	(B)	**47.**	(B)	**48.**	(B)	**49.**	(B)	**50.**	(C)
51.	(D)	**52.**	(C)	**53.**	(C)	**54.**	(A)	**55.**	(C)
56.	(C)	**57.**	(C)	**58.**	(B)				

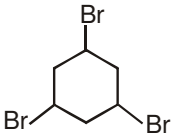
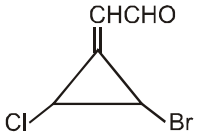
PART – III

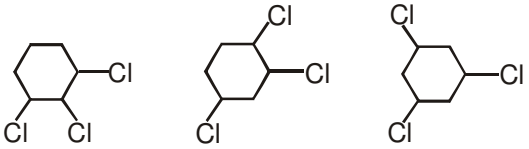
1.	(C)	**2.**	(D)	**3.**	(C)	**4.**	(C)	**5.**	(B)
6.	(A)	**7.**	(D)	**8.**	(A)	**9.**	(ABD)	**10.**	(ABCD)
11.	(BC)	**12.**	(ABCD)	**13.**	(ACD)	**14.**	(BCD)	**15.**	25%
16.	Zero (as none of its stereoisomer is chiral)					**17.**	3 (A = 1, B = 2)		
18.	6	**19.**	7 (i, ii, iii, iv, v, viii, ix)			**20.**	5	**21.**	(B)
22.	(A)	**23.**	(A)						

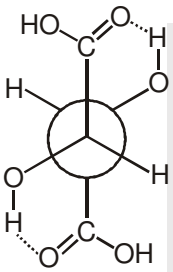
APSP Solutions

PART – I

4.  geometrical isomers = 2 ;  geometrical isomers = 0

 geometrical isomers = 2 ;  geometrical isomers = 4

5. 

7.  (Anti form)

16. Both are identical species $H_3C-\underset{\displaystyle CH_3}{\underset{|}{CH}}-Cl$ in 1, there is no asymmetric carbon atom present.
2, 3, 4 have pairs of compounds which have chiral carbon and are non superimposible on each other.

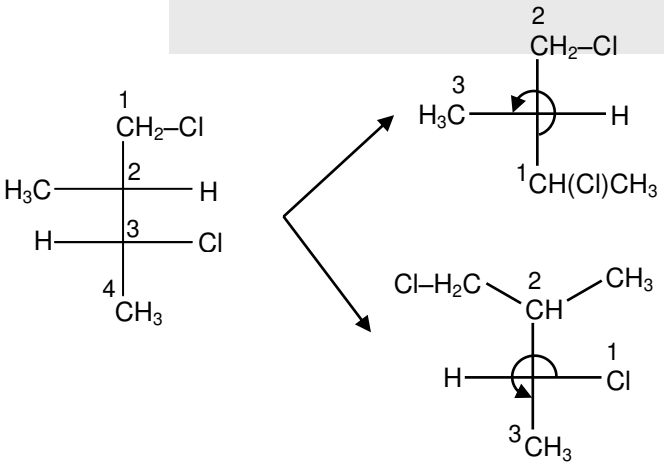
17. Compounds are diastereomers.

18. When –OH is present at right side of horizontal line & high priority at the top than it is consider as D & if left side then L.

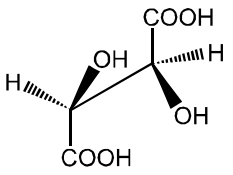
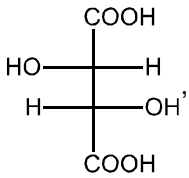
19. 2, 2`6, 6` tetra substituted biphenyls are optically active

20. $CH_3-CH_2-\overset{*}{\underset{\displaystyle CH_3}{\underset{|}{CH}}}-COOH$

22. Because bigger methyl groups come closer to each other in fully ellipsed conformer.

23. 

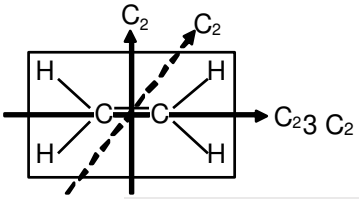
24. Follow conditions of geometrical isomerism.

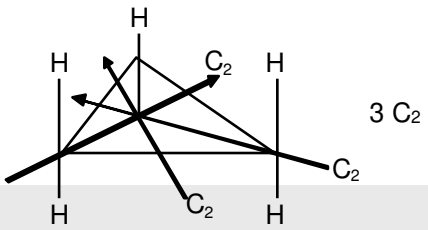
28. II  is  , therefore I and II are identical.

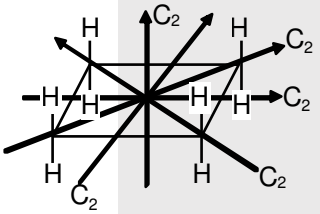
29. There are two stereocentres in the compound, so total stereoisomers = $2^2 = 4$. All 4 will be optically active.

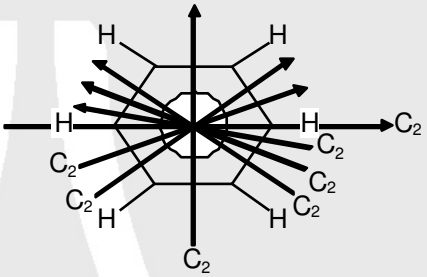
PART – III

2. Benzene has two-fold of symmetry.

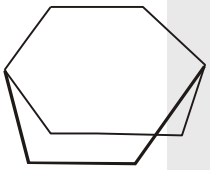
(A)  3 C_2

(B)  3 C_2

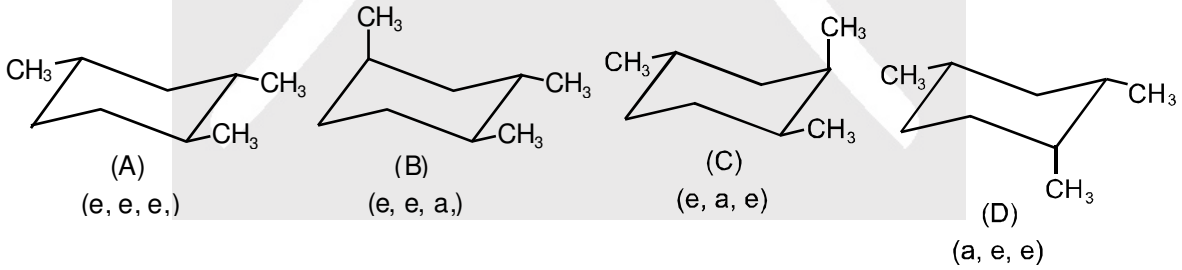
(C)  5 C_2

(D)  7 C_2

3. Compound (I) and (II) are diastereomer

4. 

5. Infact "B" is the half chair conformation of cyclohexane.

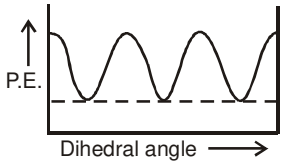
6. 

(A) (e, e, e,)

(B) (e, e, a,)

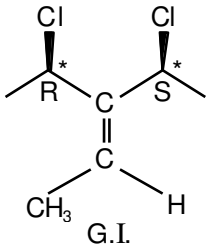
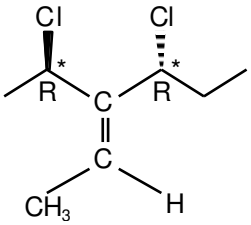
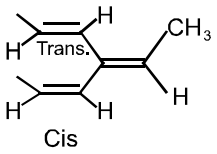
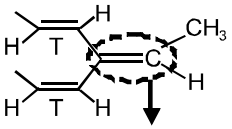
(C) (e, a, e)

(D) (a, e, e)

8. All have the P.E. diagram like 

9. The final esters have only one chiral carbon atom and these are mirror image of each other, so product mixture is racemic.

11. Due to Hydrogen bonding Gauche conformation of $H_2N–CH_2–CH_2–NH_2$ and $HO–CH_2–CH_2–F$ are more stable than anti conformations. In case of $ClCH_2CH_2Cl$ on increasing temperature % of Gauche conformation increases. Hence dipole moment increases. In case of option (D) boat conformation is more stable.

13. (A)  (B)  (C)  (D) 

G.I.

Cis

only pesudo chiral carbon exists

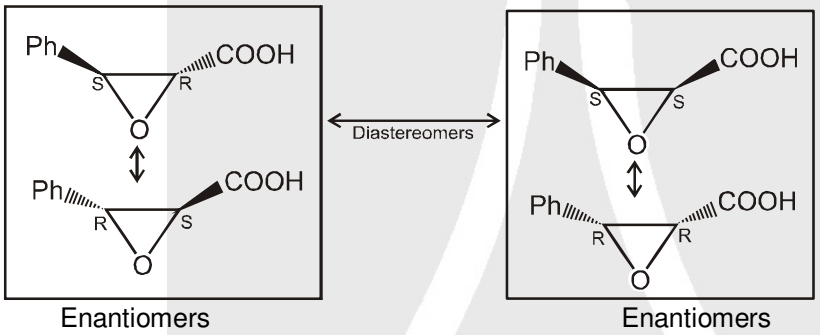
14. I and II have different positions of π-bond, these are positional isomers. Similarly II and III are also positional isomers.
I and III are geometrical isomers.

15. Enatiomeirc excess = $\frac{\text{observed rotation}}{\text{specific rotation of pure enantiomer}} = \frac{-50^\circ}{-100^\circ} \times 100 = 50\%$

% of laevorotatory isomer = 50 + 25%
% of dextrorotatory isomer = 25%

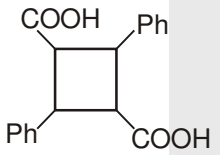
17. A = 1, B = 2 $\Rightarrow$ A + B = 3.

18. 4 + 2 = 6

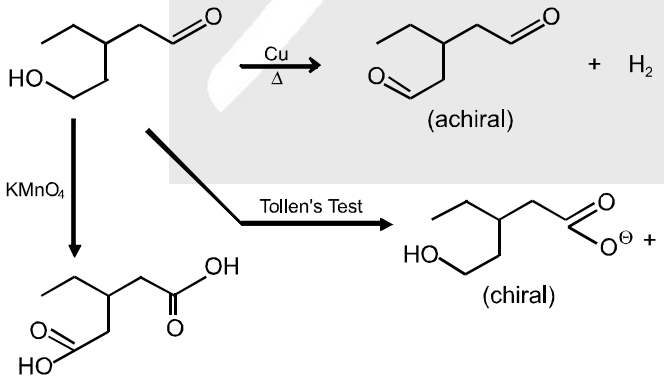


Diastereomers

Enantiomers Enantiomers

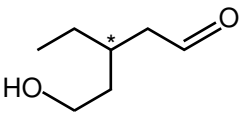
20. 

5 (All geometrical)

21. 

(achiral)

(chiral)

22. 

One chiral center may have (R) or (S) configuration. Hence, two stereoisomers.