Exercise-1

✍ **Marked Questions may have for Revision Questions.**

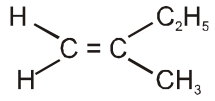
PART - I : SUBJECTIVE QUESTIONS

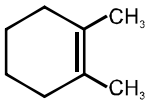
Section (A) : Geometrical isomerism

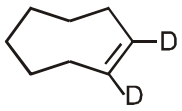
A-1. Write the essential conditions for geometrical isomerism.

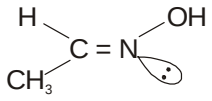
A-2. Define restricted rotation and give one example each of acyclic and cyclic compound, which can show geometrical isomersm.

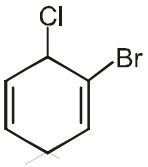
A-3. Which of the following can show geometrical isomerism?

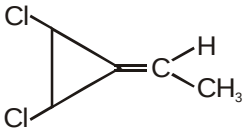
(i) 

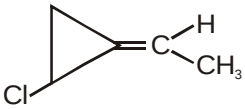
(ii) 

(iii) 

(iv) 

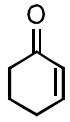
(v) 

(vi) 

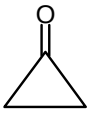
(vii) 

(viii) CH_2= CH – CH = CH – Ph

A-4. ✍ Which of the following carbonyl compound will give two products after reaction with NH_2OH ?

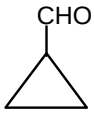
(i) 

(ii) CH_3–CHO

(iii) 

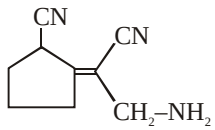
(iv) DCHO

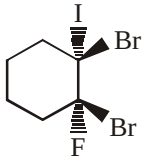
(v) 

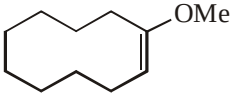
(vi) 

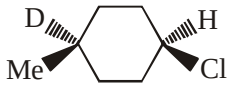
Section (B) : CIP Rules (E/Z Naming) & Physical Properties of G.I

B-1. Assign E or Z to the following compounds-

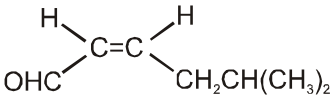
(a) 

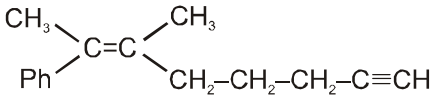
(b) 

(c) 

(d) 

B-2. Give the IUPAC names with stereochemical descriptors (E/Z) for each of the following compounds.

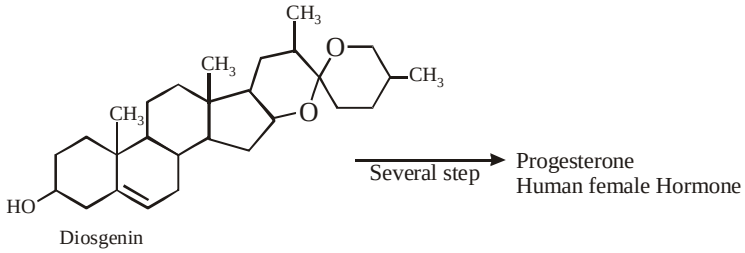
(a) 

(b) 

B-3. ✍ **(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

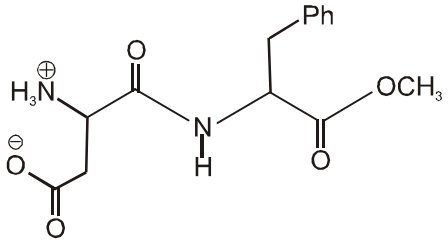
C-1.



Diosgenin

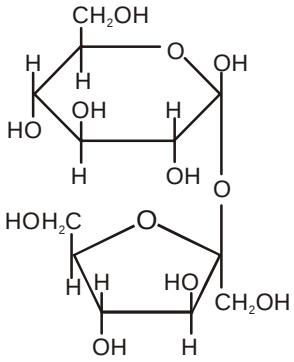
What is number of chiral centres present in Diosgenen is ?

C-2. The total number of chiral centres present in the artificial sweetener Aspartam are



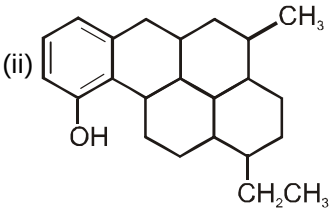
C-3. How many number of chiral centres present in the following compounds ?

(i)



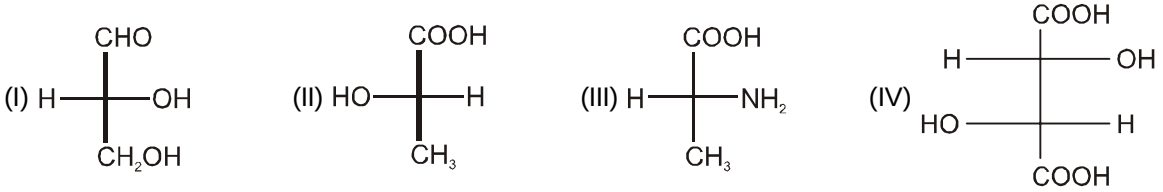
D(+)-Sucrose

(ii)

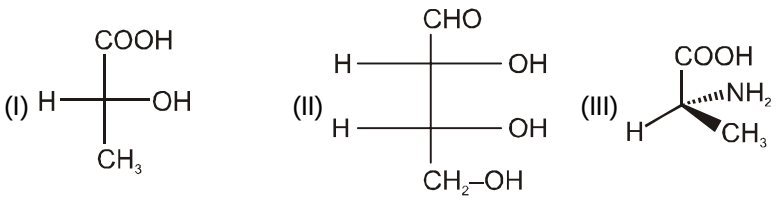


Section (D) : R/S & D/L naming

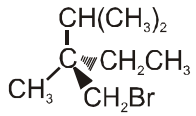
D-1. Find R/S configuration of following compounds.

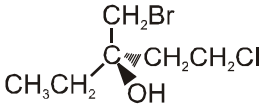


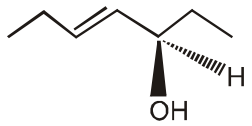
D-2. Find D/L configuration in the following molecules.

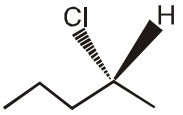


D-3. The R/S configuration of following compounds are :

(a) 

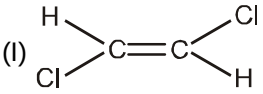
(b) 

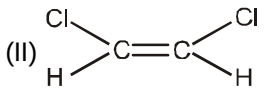
(c) 

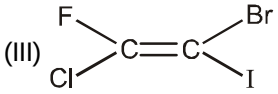
(d) 

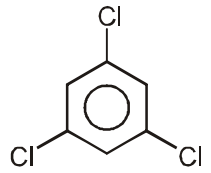
Section (E) : Element of Symmetries (POS, COS, AOS)

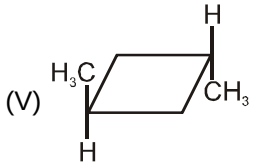
E-1. Find plane of symmetry and centre of symmetry (if possible) in the following compounds.

(I) 

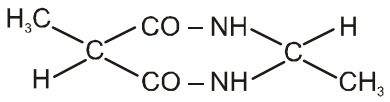
(II) 

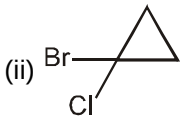
(III) 

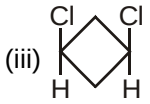
(IV) 

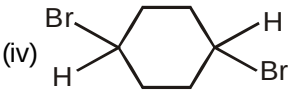
(V) 

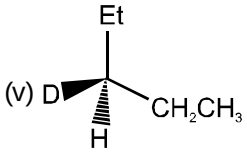
E-2. Find plane of symmerty, centre of symmerty and axis of symmetry (if possible) in the following molecules.

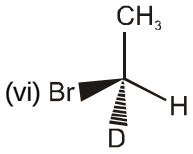
(i) 

(ii) 

(iii) 

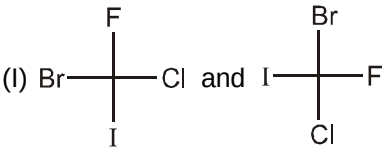
(iv) 

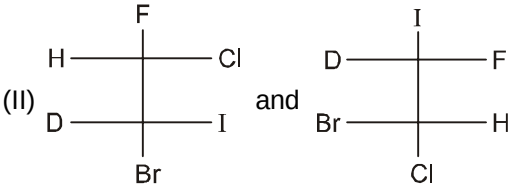
(v) 

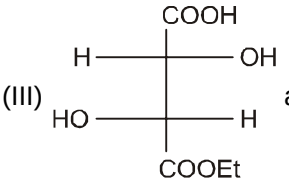
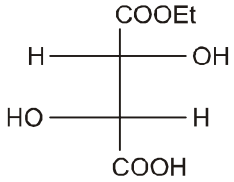
(vi) 

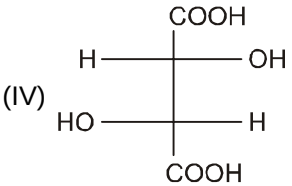
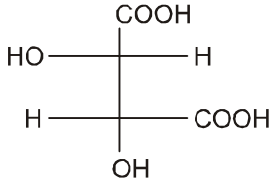
Section (F) : Definition and Properties of Enantiomers, Diastereomers, Mesocompounds

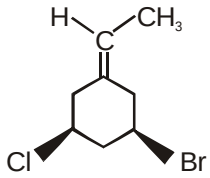
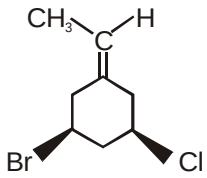
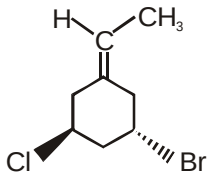
F-1. Find relationship between the given pairs.

(I) 

(II) 

(III) 
and


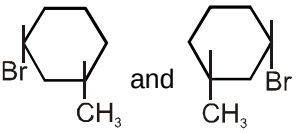
(IV) 
and


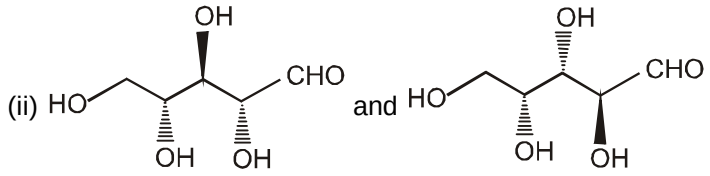
F-2.   

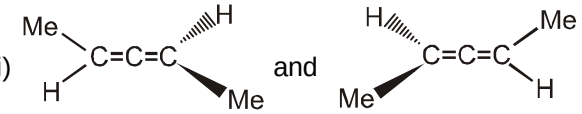
I II III

(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.

F-3. State the relationship among the following pairs of compounds.

(i) 

(ii) 

(iii) 

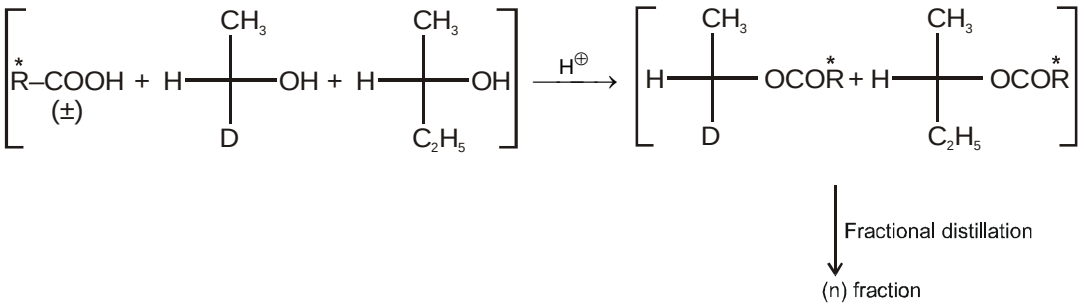
Section (G) : Specific rotation, optical purity, enantiomeric excess and Optical Resolution

G-1. What does D/L & d/ℓ represent?

G-2. Write the definition of specific rotation.

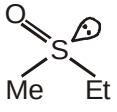
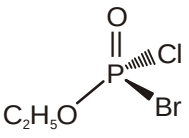
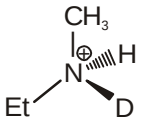
G-3. Write the formula for optical purity & enantiomeric excess.

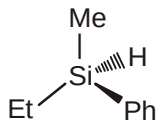
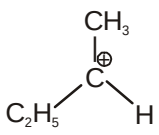
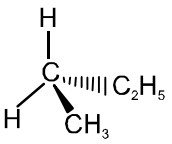
G-4. The total number of fractions (n) obtained in the following reaction is .....



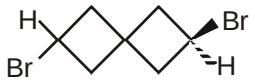
Section (H) : Optical active compounds without chiral carbon and amine inversion

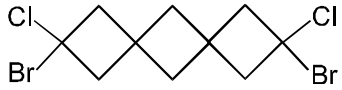
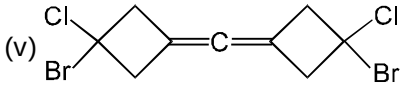
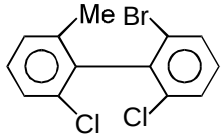
H-1. Which of the following are chiral compound?

(i)  (ii)  (iii) 

(iv)  (v)  (vi) 

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 number of Stereoisomers

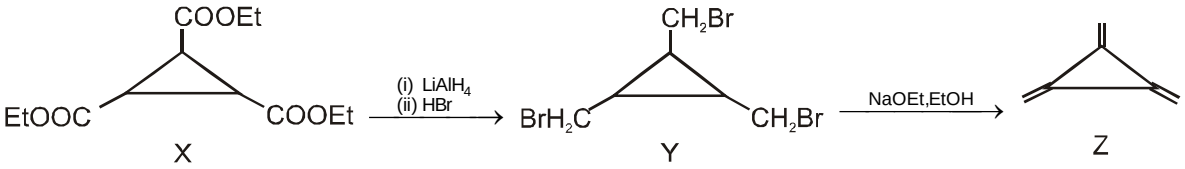
I-1. How many n-octene can show geometrical isomerism ?

I-2. 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-3. The total number of possible isomers with molecular formula C_6H_{12} that contain a cyclobutane ring.

I-4. Trimethylene cyclopropane (A) is another isomer of benzene. It can be prepared from (X) as follows.



Draw the structures of the stereoisomers of X.

I-5. The number of isomers for the compound with molecular formula $C_2BrClFI$ are :

Section (J) : Conformational Isomerism

J-1. Draw the most stable conformation of meso-$CH_3CHD - CHDCH_3$

J-2. Write the most polar and most stable conformer of 1-nitropropane.

J-3. 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.

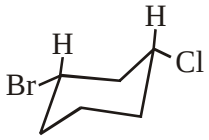
J-4. Draw the most stable newman projection formula along C_1–C_2 bonds of following compounds.

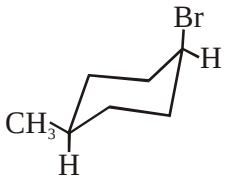
(i) $\overset{1}{C}H_3-\overset{2}{C}H_2-CH_3$ (ii) $\overset{1}{C}H_3-\overset{2}{C}H(CH_3)-CH_3$ (iii) $\overset{1}{C}H_3-\overset{2}{C}(CH_3)_2-CH_3$

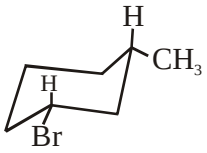
(iv) $CH_3-\underset{1}{\overset{CH_3}{C}}H-\underset{2}{\overset{CH_3}{C}}H-CH_3$ (v) $HO-\overset{1}{C}H_2-\overset{2}{C}H_2-F$ (vi) $HOOC-\underset{1}{\overset{OH}{C}}H-\underset{2}{\overset{OH}{C}}H-COOH$

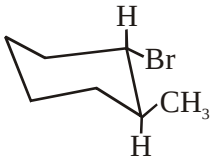
Section (K) : Cyclohexane

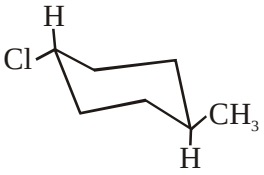
K-1. Determine whether each of the following compounds is a cis isomer or a trans isomer.

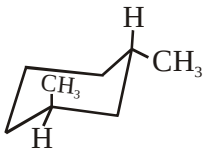
(a) 

(b) 

(c) 

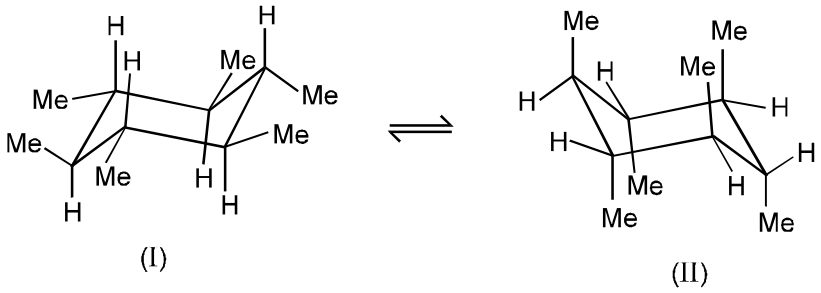
(d) 

(e) 

(f) 

K-2. 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-3. Which one is more stable and why ?

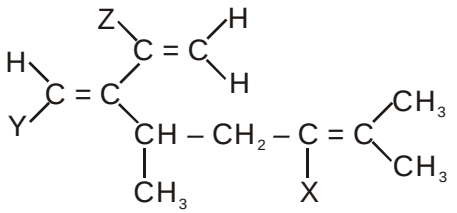


(I) (II)

PART-II : OBJECTIVE QUESTIONS

Section (A) : Geometrical isomerism

A-1. In the given haloalkene M, atoms X, Y and Z represents hydrogen or bromine or chlorine. To show cis-trans isomerism, what could be the identities of atoms X, Y and Z?

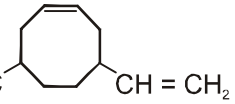


(M)

	X	Y	Z
1	Cl	H	Cl
2	H	Br	Cl
3	H	Br	H

(A) 1, 2 and 3 (B) 1 and 2 only (C) 2 and 3 only (D) 1 and 3 only

A-2. Which of the following will not show geometrical isomerism ?

(1) $CH_3 - N = N - CH = CH_2$ (2) 

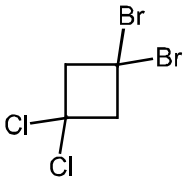
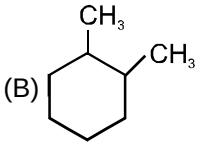
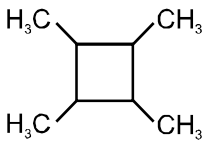
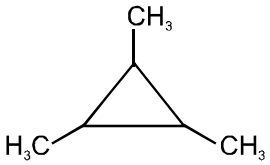
(3) $CH_3 - CH = N - OH$ (4) Cl–CH=C=CH–Cl

A-3. Which of the following compounds will not show geometrical isomerism ?

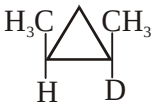
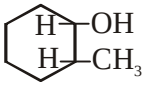
(A) Azomethane (B) 1-Bromo-2-chloroethene

(C) 1-Phenylpropene (D) 2-Methyl-2-butene

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

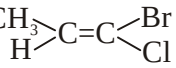
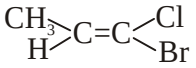
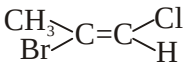
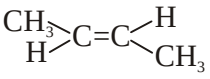
(A)  (B)  (C)  (D) 

A-5. Which among the following will show geometrical isomerism ?

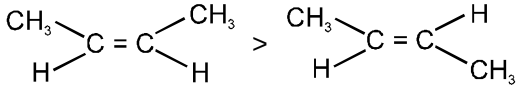
(A)  (B)  (C) C_6H_5–CH=N–OH (D) All of these

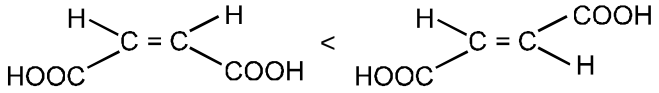
Section (B) : CIP Rules (E/Z Naming) & Physical Properties of G.I

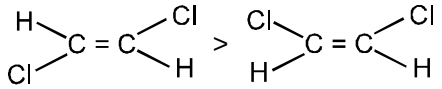
B-1. Which one of the following is Z isomer ?

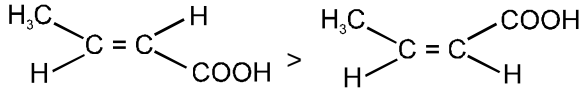
(A)  (B)  (C)  (D) 

B-2. The correct order/s for the given pair of isomers is

(A)  (Melting point)

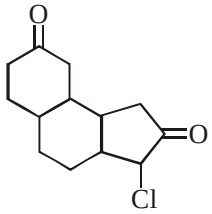
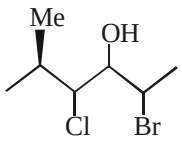
(B)  (Dipole moment)

(C)  (Boiling point)

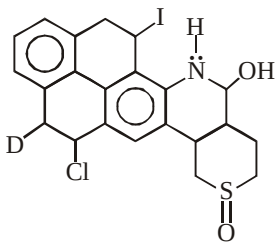
(D)  (Water solubility)

Section (C) : Chiral carbon and Projection Formula

C-1. Number of chiral centres in [X] & [Y] is a & b respectively. The value of (a–b) is :

[X] =  [Y] = 

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

C-2.  has 'x' chiral centre then find the value of x :

(A) 7 (B) 8 (C) 6 (D) 5

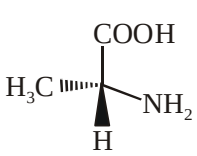
C-3. Chiral molecules are :

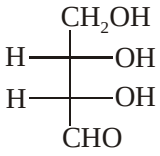
(A) Superimposable on their mirror image (B) Not superimposable on their mirror image

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

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

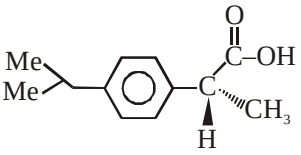
D-1. Configuration of I & II respectively will be :

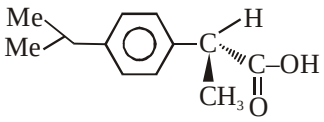


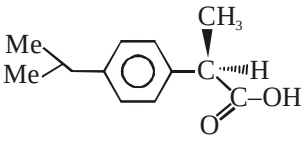


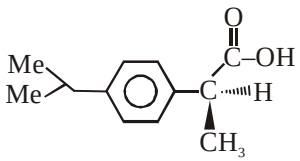
(A) D, D (B) L , D (C) D , L (D) L, L

D-2. The S-ibuprofen is responsible for its pain relveing property. Which one of the structure shown is S-ibuprofen :

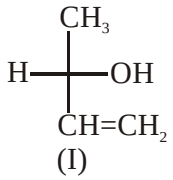
(A) 

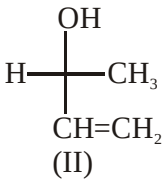
(B) 

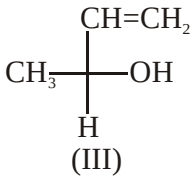
(C) 

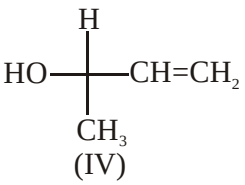
(D) 

D-3. Which of the following combinations amongst the four Fischer projections represents the same absolute configurations ?


(I)

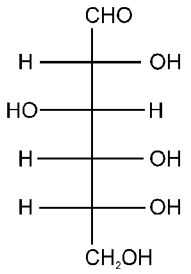

(II)


(III)


(IV)

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

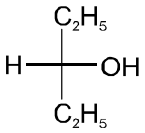
D-4.. The correct IUPAC name of D-Glucose is :

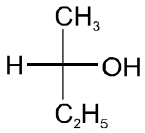


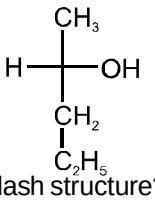
(D-Glucose)

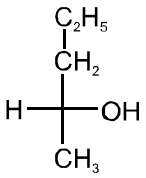
(1) (2D, 3D, 4L, 5D)-2, 3, 4, 5, 6-pentahydroxyhexanal
(2) D-2, 3, 4, 5, 6-pentahydroxyhexanal
(3) 6-oxo-(2D, 3L, 4D, 5D)-2, 3, 4, 5, 6-pentahydroxohexane
(4) (2D, 3L, 4D, 5D)-2, 3, 4, 5, 6-pentahydroxyhexanal

D-5. Which of the following is the structure of (S)-Pentan-2-ol is ?

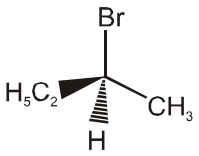
(A) 

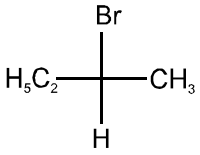
(B) 

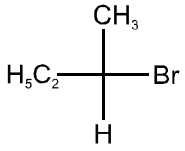
(C) 

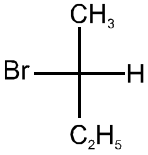
(D) 

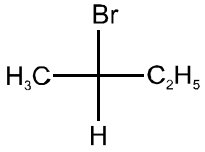
D-6. Which Fisher projection represents the given wedge dash structure?



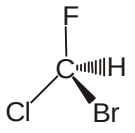
(A) 

(B) 

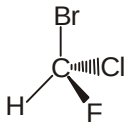
(C) 

(D) 

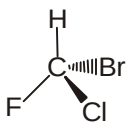
D-7. Which of the following have same configuration?



I



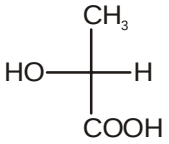
II

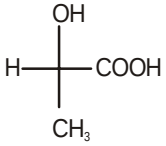


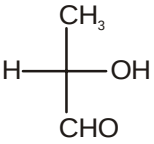
III

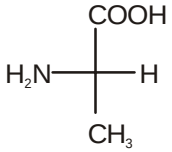
(A) I & II (B) II & III (C) I & III (D) All

D-8. Which has D configuration?

(A) 

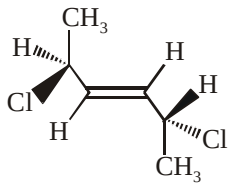
(B) 

(C) 

(D) 

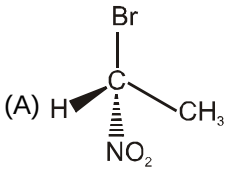
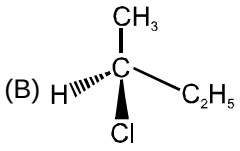
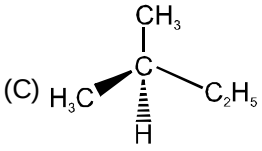
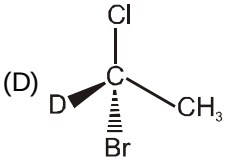
Section (E) : Element of Symmetries (POS, COS, AOS)

E-1. Compound have :

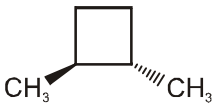
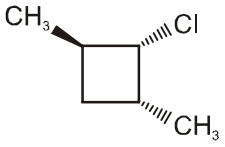
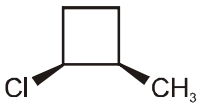
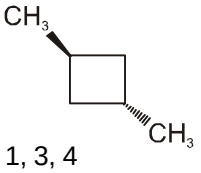


(A) Plane of symmetry (B) Centre of symmetry
(C) Axis of symmetry (D) None

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

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

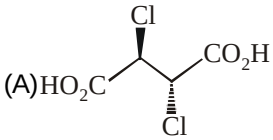
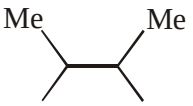
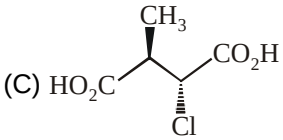
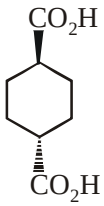
E-3. Which of the following are chiral ?

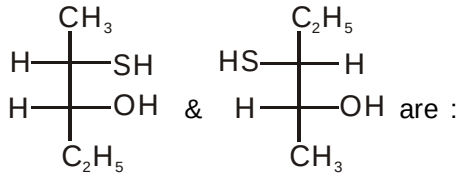
(1)  (2)  (3)  (4) 

(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

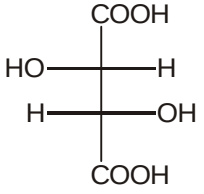
F-1. Identify meso compound.

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

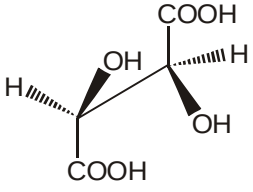
F-2.  are :

(A) Diastereomers (B) Enantiomers (C) Identical (D) Constitutional isomers

F-3. The two compounds (I) and (II) are related as :


(I)

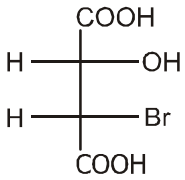
and

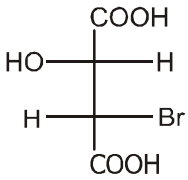

(II)

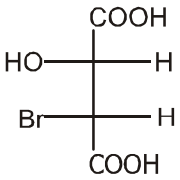
(A) Enantiomers (B) Anomers (C) Diastereomers (D) Identical

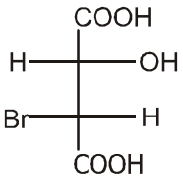
F-4. Stereoisomers which are not mirror image of each other, are called :
(A) Enantiomers (B) Tautomers (C) Meso (D) Diastereomers

F-5. Which one among the following is not diastereomeric pair?


(I)

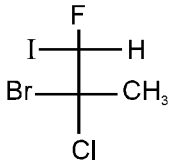

(II)

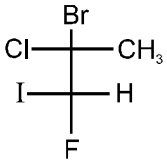

(III)


(IV)

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

F-6. What is the relationship between (I) & (II) ?


(I)

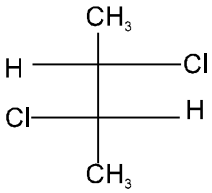
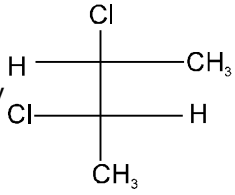

(II)

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

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

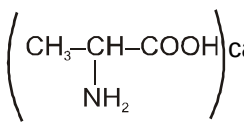
G-1. When an optically active compound is placed in a 10 dm tube is present 20 gm in a 200 ml solution rotates the PPL by 30°. Calculate the angle of rotation & specific angle of rotation if above solution is diluted to 1 Litre?
(A) 16° & 36° (B) 6° & 30° (C) 3° & 30° (D) 6° & 36°

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

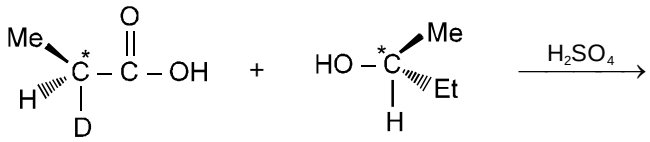
(A) –36º (B) 0º (C) +36º (D) unpredictable

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%, – 27unit

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

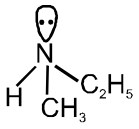
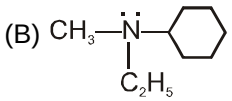
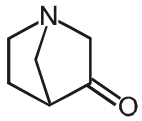
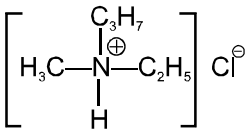


(A) A single stereoisomer (optically active) (B) A mixture of diastereomers (both optically active)
(C) A racemic mixture (optically inactive) (D) A mixture of four stereoisomers (two racemic mixtures)

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

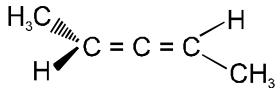
H-1*. Which of the following compounds will show optical activity ?

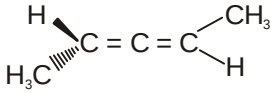
(A)  (B)  (C)  (D) 

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

(A) CH_3NH_2 (B) $CH_3NHC_2H_5$ (C) $CH_3CH_2CH_2-N\begin{matrix}CH_3\\C_2H_5\end{matrix}$ (D) sec-Butylamine

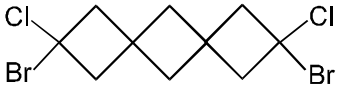
H-3. The following molecules are :

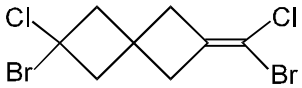


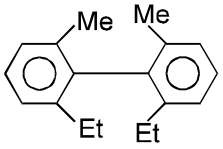


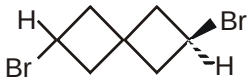
(A) Enantiomers (B) Diastereomers (C) Identical (D) Conformers

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

(A) 

(B) 

(C) 

(D) 

Section (I) : Calculation of no. of Stereoisomers

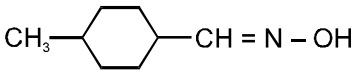
I-1. How many stereoisomers of the following molecule are possible ?

HOOC.CH=C=CH.COOH

(A) Two optical isomers (B) Two geometrical isomers
(C) Two optical and two geometrical isomers (D) None

I-2. How many geometrical isomers are possible for the given compound?
Ph – CH = CH – CH = CH – COOH
(A) 2 (B) 4 (C) 6 (D) 8

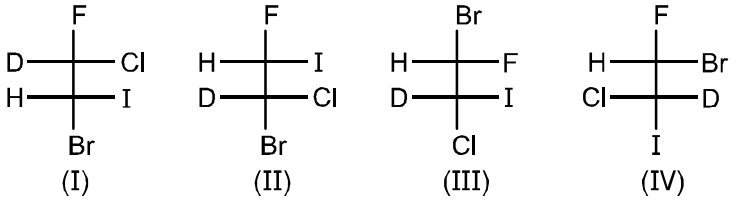
I-3. How many geometrical isomers are possible for the given compound?



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

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

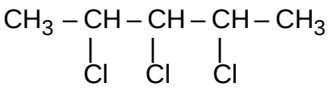
I-5. Number of fractions on fractional distillation of mixture of :



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

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

I-6. Total number of optically active stereoisomers of

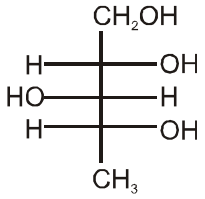


(A) 2 (B) 4 (C) 6 (D) 8

I-7. 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-8. 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

I-9.

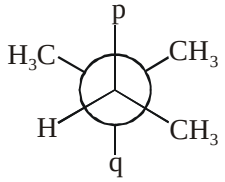


is a Fischer projection of one of_____stereoisomers?

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

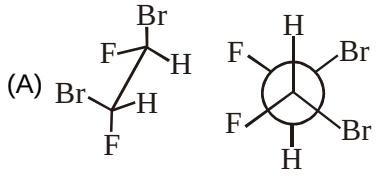
Section (J) : Conformational Isomerism

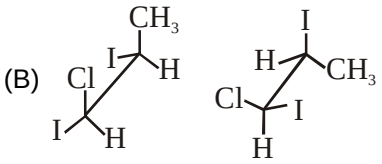
J-1. What is the value of p & q of following conformer of 2,3-dimethyl butane ?

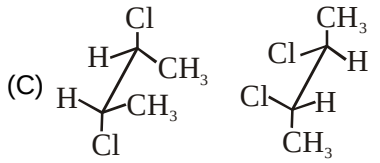


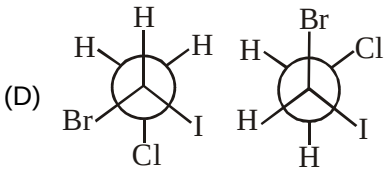
(A) p = H, q = H (B) p = CH_3, q = CH_3 (C) p = CH_3, q = H (D) p = H, q = CH_3

J-2. Which of the following pairs of compound is/are identical ?

(A) 

(B) 

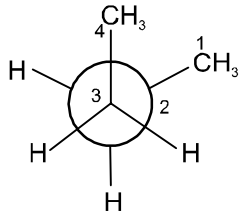
(C) 

(D) 

J-3. 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

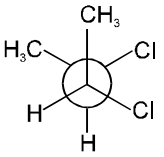
J-4. The Baeyer's angle strain is expected to be maximum in
(A) Cyclodecane (B) Cyclopentane (C) Cyclobutane (D) Cyclopropane

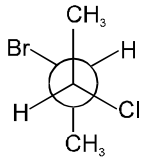
J-5. Newman projection of Butane is given,C-2 is rotated by 120º along C_2-C_3 bond in anticlockwise direction the conformation formed is :

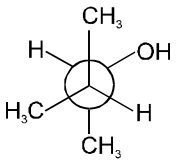


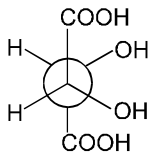
(A) anti (B) fully eclipsed (C) gauche (D) partially eclipsed

J-6. Which of the following is an achiral molecule?

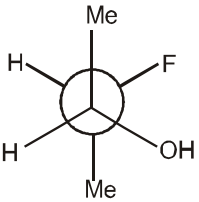
(A) 

(B) 

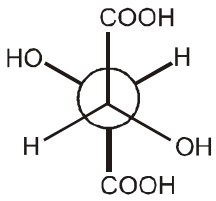
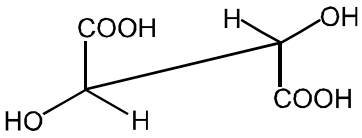
(C) 

(D) 

J-7. 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-8.  and  are

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

Section (K) : Cyclohexane

K-1. When cyclohexane is poured on water, it floats, because :

(A) cyclohexane is in 'boat' form (B) cyclohexane is in 'chair' form

(C) cyclohexane is in 'crown' form (D) cyclohexane is less dense than water

K-2. The least stable conformation of cyclohexane is

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

K-3. 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-4. Chair form of cyclohexane is more stable than boat form because :

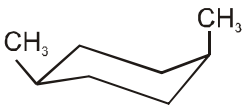
(A) In chair form carbons are in staggered form and in boat form carbons are in eclipsed form

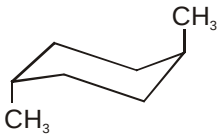
(B) In chair form carbons are in eclipsed form and in boat form all the carbons are in staggered form

(C) Bond angle in chair form is 111° and bond angle in boat form is 109.5°

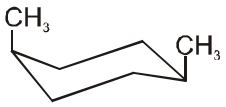
(D) Bond angle in chair form is 109.5° and in boat form 111°

K-5. The most stable form of trans-1,4-dimethylcyclohexane is represented as :

(A) 

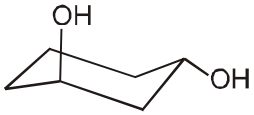
(B) 

(C) 

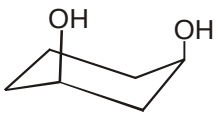
(D) 

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

(A) 

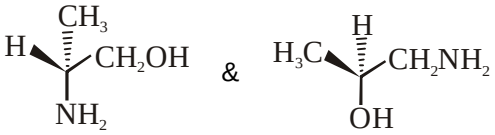
(B) 

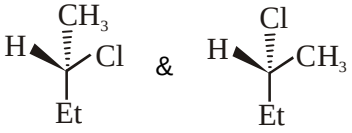
(C) 

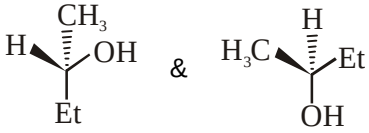
(D) 

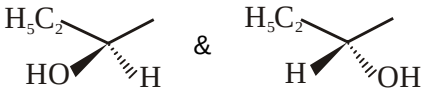
PART - III : MATCH THE COLUMN

1. **Column I** **Column II**

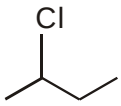
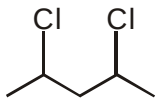
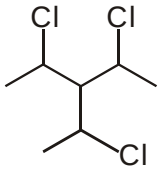
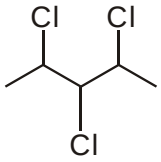
(A)  (P) Structural

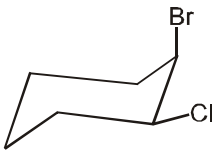
(B)  (Q) Identical

(C)  (R) Enantiomers

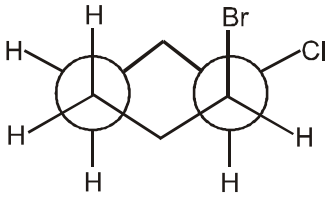
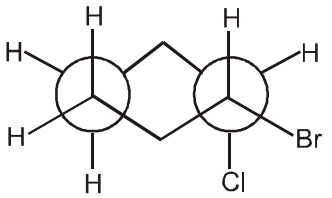
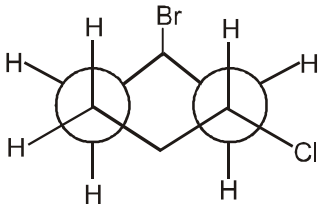
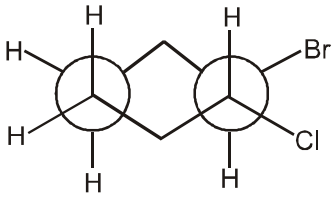
(D)  (S) Diastereomers

2. Match the column–I

Column-I (Compounds)		Column-II (Total number of stereoisomers)	
(1)		(P)	8
(2)		(Q)	4
(3)		(R)	3
(4)		(S)	2

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

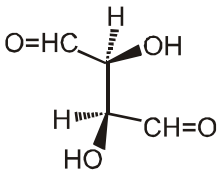
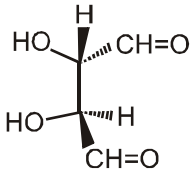
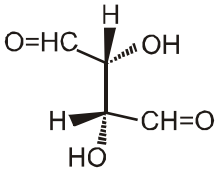
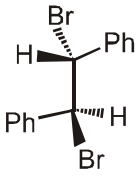
mentioned in **Column-II.**

	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

4. Match the column-I with column-II

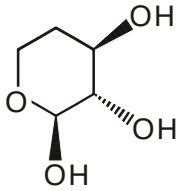
Column-I	**Column-II**
(A) 	(P) Chiral Molecule
(B) 	(Q) Achiral Molecule
(C) 	(R) Plane or centre of symmetry present
(D) 	(S) Axis of symmetry present (except C_1).

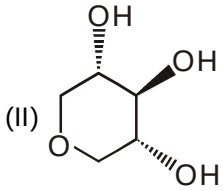
Exercise-2

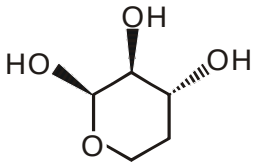
Marked Questions may have for Revision Questions.

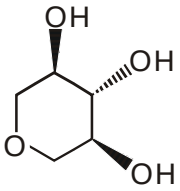
PART - I : OBJECTIVE QUESTIONS

1. Which two of the following compounds are diastereomers?

(I) 

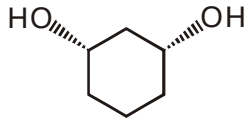
(II) 

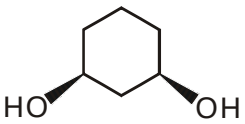
(III) 

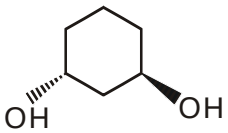
(IV) 

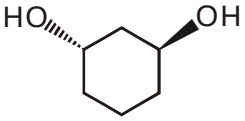
(A) I & II (B) II & IV (C) III & IV (D) I & III

2. Which two of the following compounds represents a pair of enantiomers?

(I) 

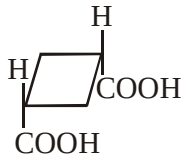
(II) 

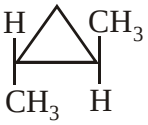
(III) 

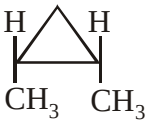
(IV) 

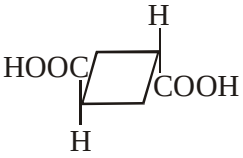
(A) I & II (B) II & III (C) III & IV (D) II & IV

3. Which one of the following is resolvable ?

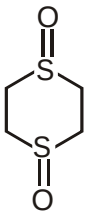
(A) 

(B) 

(C) 

(D) 

4. The correct statement for the given compound is

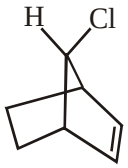


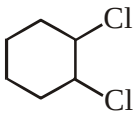
(A) It can shows geometrical isomerism
(B) It can show optical isomerism
(C) It contain chiral centre
(D) None of these

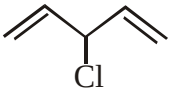
5. Compound CH_2Cl_2 contain :

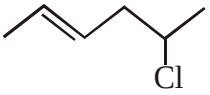
(A) Plane of symmetry
(B) Centre of symmetry
(C) Axis of symmetry
(D) Both (A) & (C)

6. Which of the following can not show geometrical isomerism :

(A) 

(B) 

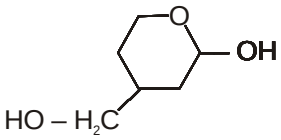
(C) 

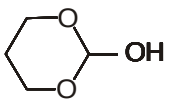
(D) 

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

(A) 

(B) 

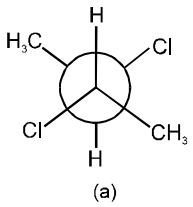
(C) 

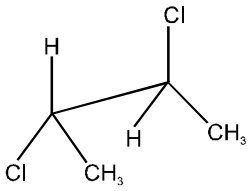
(D) 

8. Number of conformational isomers of ethane

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

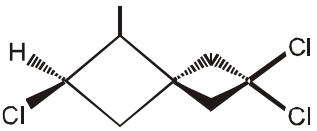
9. Which of the following statement regarding the projections shown below is true ?


(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

10. The given compound (X) has :



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

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

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

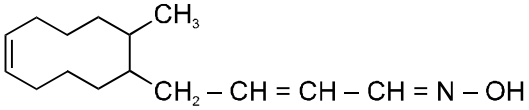
(A) $CH_3-CH_2-\underset{\underset{O}{\|}}{C}-CH_3 + CH_3-\underset{\underset{O}{\|}}{C}-Ph$

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

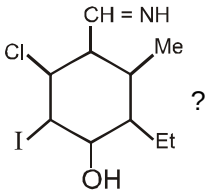
(C) $CH_2=O + CH_3CHO$

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

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

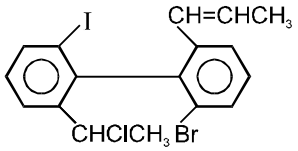


(A) 8 (B) 16 (C) 32 (D) 10

13. How many stereoisomers are possible for  ?

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

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



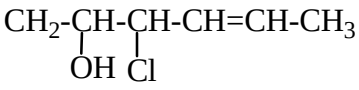
(A) 2 (B) 8 (C) 6 (D) 4

15. A pure sample of 2-chlorobutane shows rotation of PPL by 30° in standard conditions. When above sample is made impure by mixing its opposite form, so that the composition of the mixture becomes 87.5% d-form and 12.5% ℓ-form, then what will be the observed rotation for mixture.

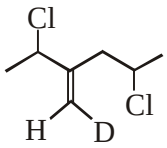
(A) – 22.5° (B) + 22.5° (C) + 7.5° (D) – 7.5°

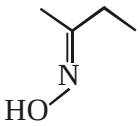
PART - II : NUMERICAL TYPE QUESTIONS

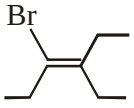
1. Identify total number of stereoisomers for the following compound ?

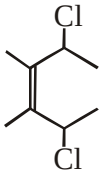


2. Identify number of molecules which usually can show geometrical isomerism (at room temperature)?

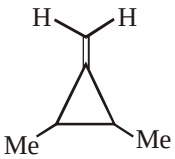
(1) 

(2) 

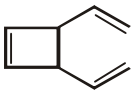
(3) 

(4) 

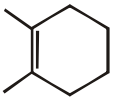
(5) 

(6) 

(7) 

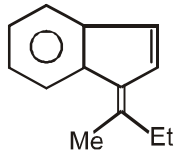
(8) 

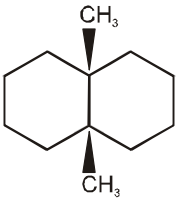
(9) 

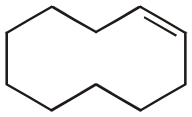
(10) 

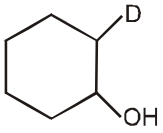
3. How many cyclic and acyclic structural isomers of C_5H_{10} can show geometrical isomerism?

4. In given compounds how many can show geometrical isomerism-

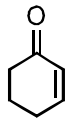
(i) 

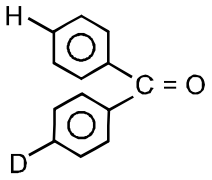
(ii) 

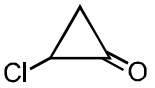
(iii) 

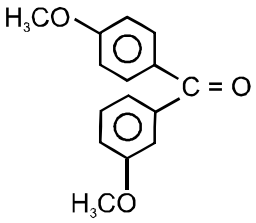
(iv) 

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

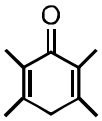
(i) 

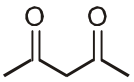
(ii) 

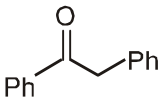
(iii) 

(iv) 

(v) 

(vi) 

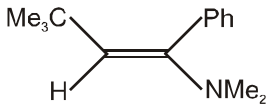
(vii) 

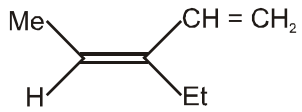
(viii) 

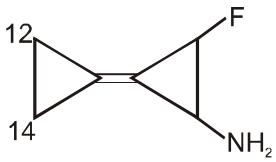
(ix) CH_3–CH=O

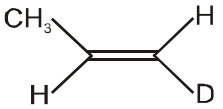
6. Total number of stereoisomers of truxillic acid are :

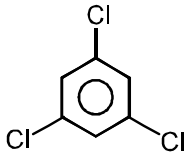
7. In given compounds how many have Z configuration along double bond ?

(i) 

(ii) 

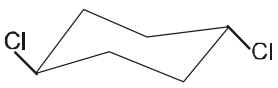
(iii) 

(iv) 

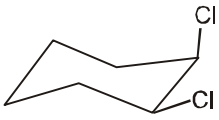
8. 

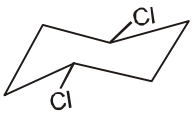
Sum of C_2 & C_3 axis of symmetry is

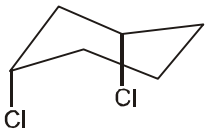
9. How many of the following are cis dichlorocyclohexane.

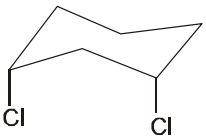
(i) 

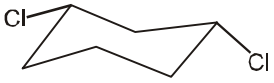
(ii) 

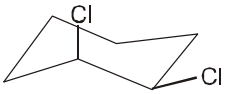
(iii) 

(iv) 

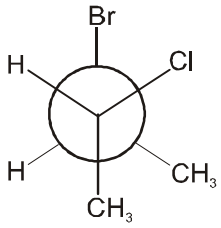
(v) 

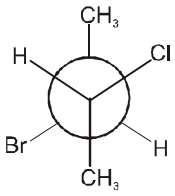
(vi) 

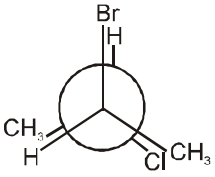
(vii) 

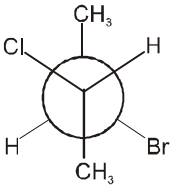
(viii) 

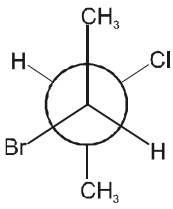
10. How many of the following are (configurational) enantionmers of (A) ?

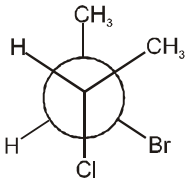
(A) = 

(p) 

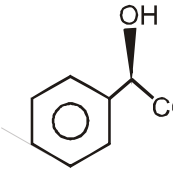
(q) 

(r) 

(s) 

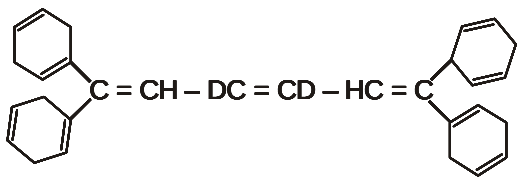
(t) 

11. 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 :

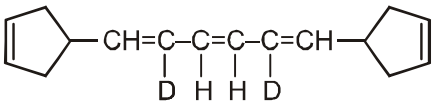
12. Pure (R) Mandelic acid 

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

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



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

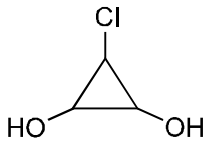


15. Total number of stereoisomers of compound $CH_3-CH=CH-\underset{\displaystyle Cl}{\underset{|}{CH}}-CH=CH-CH_3$ are :

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

17. For the compound A–CH_2–CH_{27}–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)

18. Observe the compound 'M'

M = 

If in this compound

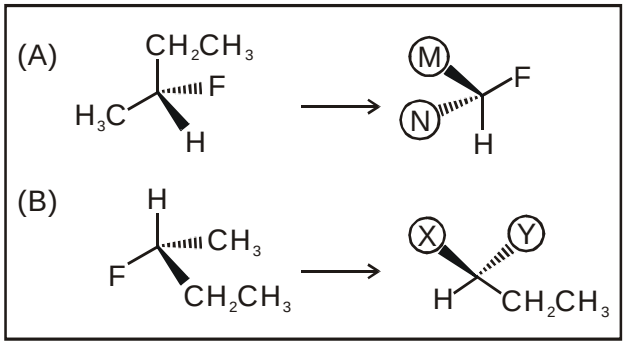
X = Total number of asymmetric C* atoms
Y = Number of similar asymmetric C* atoms
Z = Number of optically active stereoisomers
W = Number of opticaly inactive isomers
R = Number of geometrical orientations in space

Report your answer as :

X + Y + Z + W + R

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

1. Re-orient the molecule at the left to match the partially drawn perspective at the right. Find the two missing substituents at their correct positions.



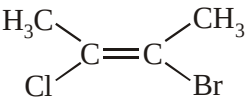
(A) $\mathbf{M}=CH_3CH_2-$ $\mathbf{N}=CH_3-$

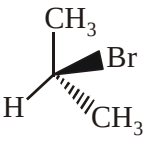
(B) $\mathbf{X}=CH_3-$ $\mathbf{Y}=F-$

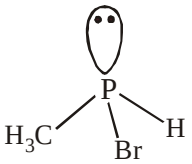
(C) $\mathbf{M}=CH_3-$ $\mathbf{N}=CH_3CH_2-$

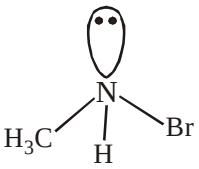
(D) $\mathbf{X}=F-$ $\mathbf{Y}=CH_3-$

2. Among the following the non- resolvable compound is/are :

(A) 

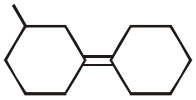
(B) 

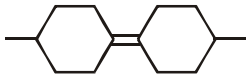
(C) 

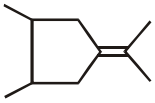
(D) 

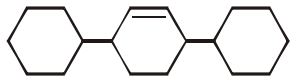
3. Which of the following statements for a meso compound is/are correct ?
(A) The meso compound has either a plane or centre of symmetry
(B) The meso compound is optically inactive due to internal compensation.
(C) The meso compound is achiral
(D) The meso compound is formed when equal amounts of two enantiomers are mixed

4. Compounds which can show both optical as well as geometrical isomerism?

(A) 

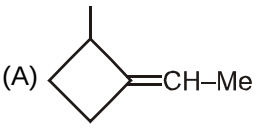
(B) 

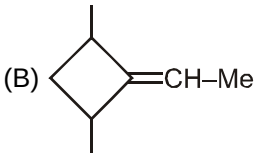
(C) 

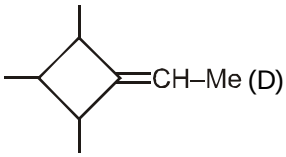
(D) 

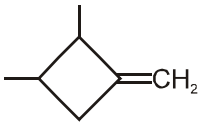
5. What should be the minimum conditions to show geometrical isomerism ?
(A) Restricted rotation about double bond or ring.
(B) Groups which are responsible to show geometrical isomerism differ in their relative distance.
(C) Free rotation about single bond.
(D) Two different groups at both restricted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

6. Which of the following compounds can show optical isomerism as well as geometrical isomerism?

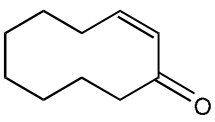
(A) 

(B) 

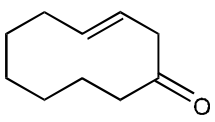
(C) 

(D) 

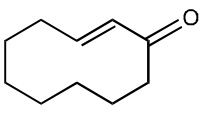
7. Which of the following statement(s) is/are true about the following compounds ?



(I)



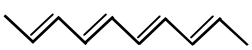
(II)



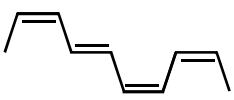
(III)

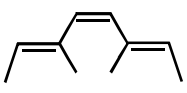
(A) (I) and (III) are identical
(B) (I) and (III) are geometrical diastereomers
(C) (I) and (II) are structural isomers.
(D) (II) and (III) are structural isomers.

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

(A) 

(B) 

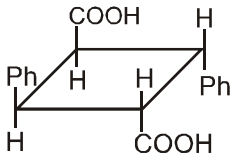
(C) 

(D) 

9. 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

10. 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 single bond does not show geometrical isomerism.
(D) Cyclodecene can show cis & trans form.

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

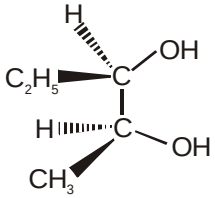


α-truxillic acid

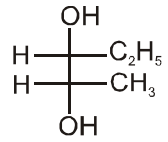
(A) It is a optically active compound
(B) It can show geometrical isomerism
(C) It posses centre of symmetry but not plane of symmetry.
(D) It is a meso compound

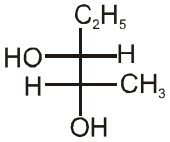
12. Find out correct statement/s.
(A) All chiral centers are stereogenic centers.
(B) All stereogenic centers are not chiral center.
(C) A compound may be chiral without chiral center.
(D) A compound will be chiral only if it has at least one chiral center.

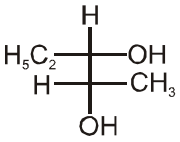
13.

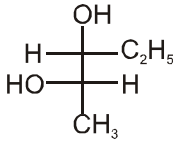


Fischer projection formula of this compound can be represented as :

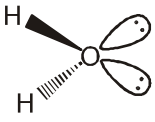
(A) 

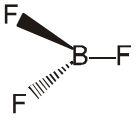
(B) 

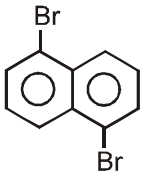
(C) 

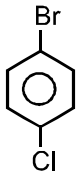
(D) 

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

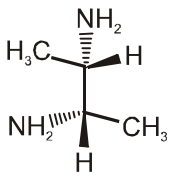
(A) 

(B) 

(C) 

(D) 

15.



is :

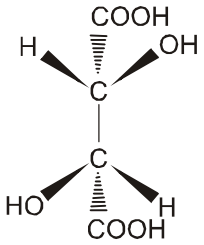
(A) optically active molecule. (B) having plane of symmetry.
(C) having axis of symmetry. (D) having centre of symmetry

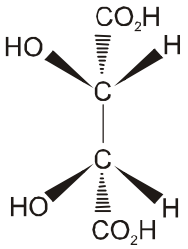
PART - IV : COMPREHENSION

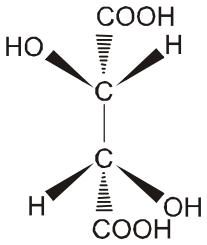
Comprehension # 1

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) 

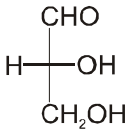
(D) none of these

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.

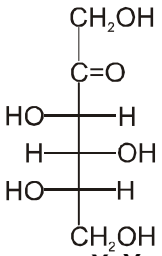
Comprehension # 2

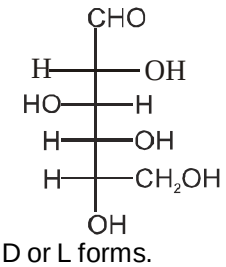
Carbohydrates are biomolecules which perform diverse functions such as being energy sources and constituents of nucleic acids.In solution, monosaccharides, the simplest unit of carohydrates, exist in cyclic hemicacetal form. The cyclic form is in equilibrium with small quantity of the open chain form.
In a trivial system of naming (D,L-system), the carbohydrates having the configuration at the asymmetric carbon of highest number same as that of R-glyceraldehyde (shown below) are called D forms while those having opposite configuration at the same carbon are called L-forms.

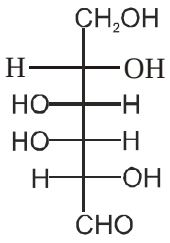


R-Glyceraldehyde

Monosacharides **X** , **Y** and **Z** have the following structures.



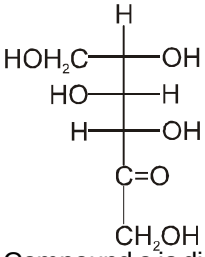


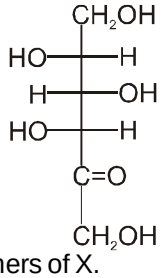


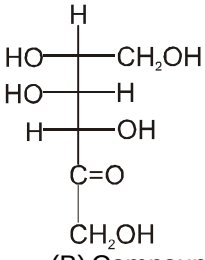
3 Classify sugars **X** ,**Y** and **Z** into D or L forms.

(A) L,L,L (B)L,L,D (C) L,D,D (D) D,L,L

4 Which is the correct term to describe the relationship of each of the following structure with X ?

(a) 

(b) 

(c) 

(A) Compound a is diastereomers of X.
(B) Compound b is identical of X.
(C) Compound c is enantiomers of X.
(D) All are correct.

Exercise-3

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

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

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

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

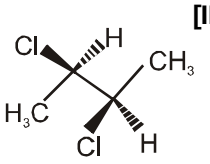
$\mu_{obs} = \Sigma\ \mu_i x_i$

where μ_{obs} = observed 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)

5. **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.

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

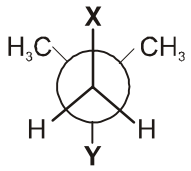


(A) The compound is optically active
(B) The compound possesses centre of symmetry
(C) The compound possesses plane of symmetry
(D) The compound possesses axis of symmetry

7.* 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.

8. 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]**

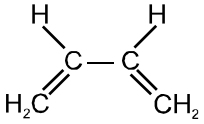
9.* In the Newman projection for 2,2-Dimethylbutane

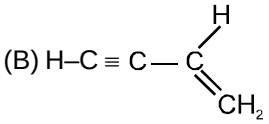


X and **Y** can respectively be : **[IIT-JEE-2010, 3/163]**

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

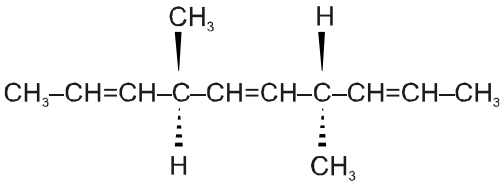
10.* Amongst the given options, the compound(s) in which all the atoms are in one plane in all the possible conformations (if any), is (are) **[JEE-2011, 4/180]**

(A) 

(B) 

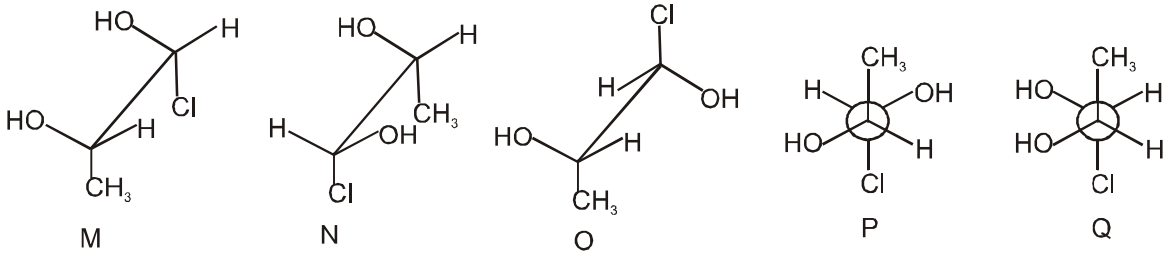
(C) $H_2C=C=O$ (D) $H_2C=C=CH_2$ **[IIT-JEE-2011, 4/180]**

11. 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

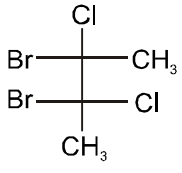
12.* Which of the given statement(s) about N, O, P and Q with respect to M is (are) correct ?



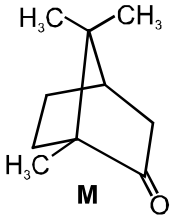
(A) M and N are non-mirror image stereoisomers (B) M and O are identical

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

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

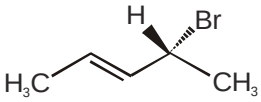


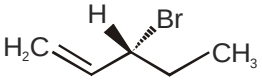
14. The total number of stereoisomers that can exist for **M** is **[JEE(Advanced)-2015, 4/168]**

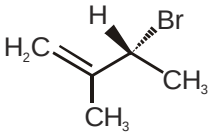


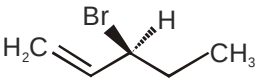
15. Compound(s) that on hydrogenation produce(s) optically inactive compound(s) is (are)

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

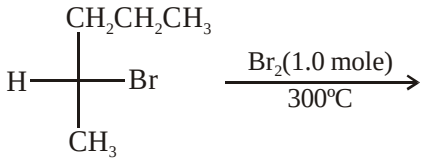
(A) 

(B) 

(C) 

(D) 

16. In the following monobromination reaction, the number of possible chiral products is : **[JEE-2016]**

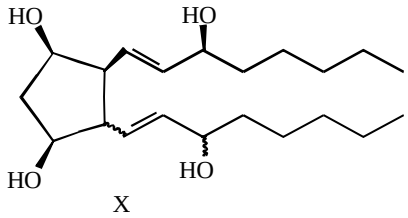


(1.0 mole)

(enatiomerically pure)

17. For the given compound X, the total number of optically active stereoisomers is____.

[IIT-JEE 2018]



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

18. Total number of isomers considering both structural and stereoisomers, of cyclic ethers with the molecular formular C_4H_8O is- **[IIT-JEE 2019]**

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

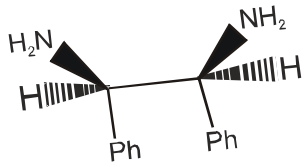
1. Which type of isomerism is shown by 2,3-dichlorobutane ? **[AIEEE 2005]**

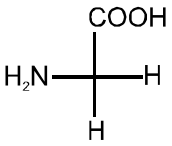
(1) diastereomerism (2) optical-isomerism
(3) geometric-isomerism (4) structural-isomerism

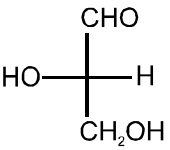
2. Increasing order of stability among the three main conformations (i.e. eclipse, anti, gauche) of 2-fluoroethanol is **[AIEEE- 2006]**

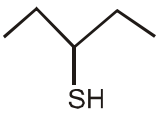
(1) eclipse, gauche, anti (2) gauche, eclipse, anti
(3) eclipse, anti, gauche (4) anti, gauche, esclipse

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

(1) 

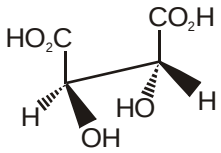
(2) 

(3) 

(4) 

4. Which one of the following conformations of cyclohexane is chiral? **[AIEEE-2007, 3/120]**

(1) Chair (2) Boat (3) Twist boat (4) Rigid

5. The absolute configuration of 

is **[AIEEE 2008, 3/105]**

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

6. 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

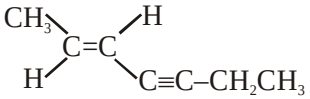
7. The number of stereoisomers possible for a compound of the molecular formula CH_3–CH=CH–CH(OH)–Me is: **[AIEEE 2009, 4/144]**

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

8. 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

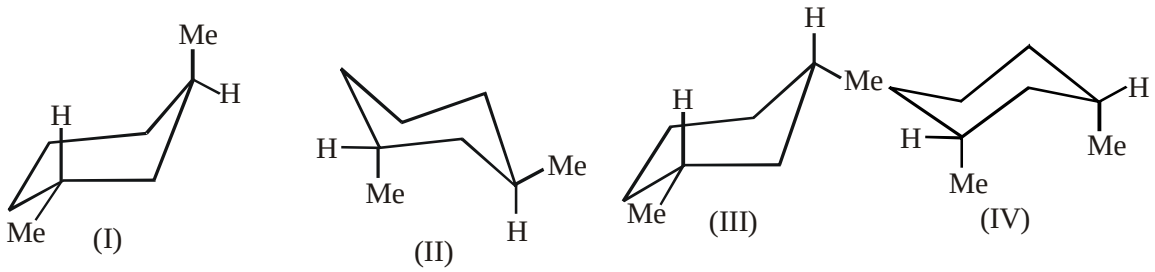
9. The IUPAC name of the following compounds is : **[JEE-MAIN-2012]**



(1) (Z)–5 hepten–3–yne (2) (Z)–2-hepten–4–yne
(3) (E)–5-hepten–3–yne (4) (E)–2-hepten–4–yne

10. Arrange in the correct order of stability (decreasing order) for the following molecules:

[JEE-MAIN 2013]

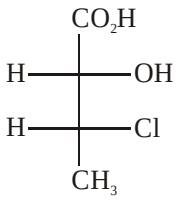


(1) (I) > (II) > (III) > (IV)
(2) (IV) > (III) > (II) ≈ (I)
(3) (III) > (I) ≈ (II) > (IV)
(4) (I) > (II) ≈ (III) > (IV)

11. Which of the following compound will exhibit geometrical isomerism ? **[JEE(Main) 2015, 4/144]**

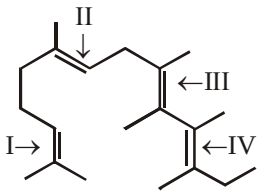
(1) 1-Phenyl-2-butene
(2) 3-Phenyl-1-butene
(3) 2-Phenyl-1-butene
(4) 1,1-Diphenyl-1-propane

12. The absolute configuration of : **[JEE-MAIN-2016]**



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

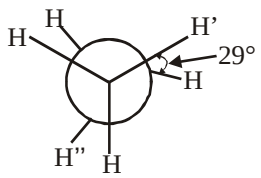
13. In the follwoing structure, the double bonds are marked as I, II, III and IV. **[JEE-MAIN-2017]**



Geometrical isomerism is not possible at site (s) :

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

14. In the following skew confromation of ethane. H'–C–C–H" dihedral angle is : **[JEE-MAIN-2019]**



(1) 58°
(2) 149°
(3) 120°
(4) 151°

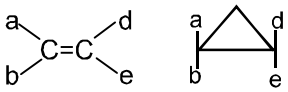
ANSWER KEY

EXERCISE # 1

PART - I

A-1. 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-2. 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-3. (iii) , (iv) , (vi) , (vii) and (viii) **A-4.** 5 (i, ii, iv, v ,vi)

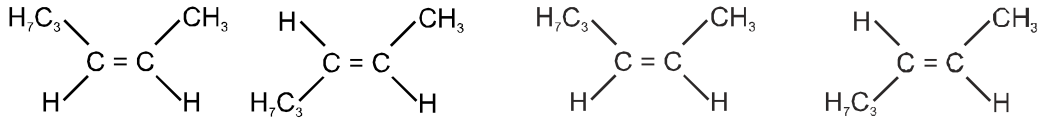
B-1. ~~ZEEZ~~

B-2. (a) Z-5-Methylhex-2-en-1-al (b) Z-6-Methyl-7-phenyloct-6-en-1-yne

B-3. **(a)** 

dipole moment : II > I

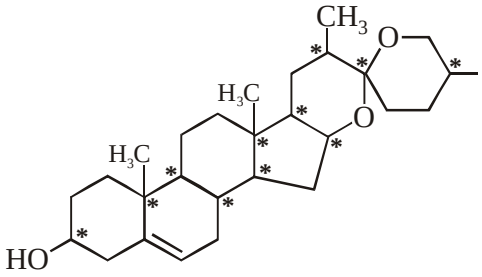
(b) Because of good packing of trans isomers.

(c) 

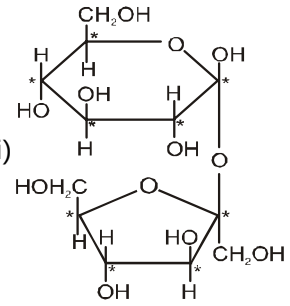
Cis-Hex-2-ene Trans-Hex-2-ene समपक्ष हेक्स-2-ब्न विपक्षहेक्स-2-ब्न

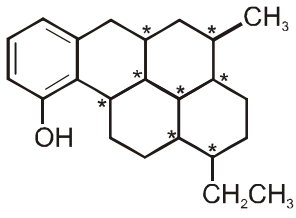
Cis has higher boiling point due to more polarity.

C-1. **(11)**

Sol. 

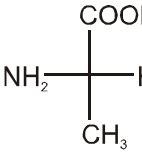
C-2. **2**

C-3. (i)  = 9

(ii)  = 8

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

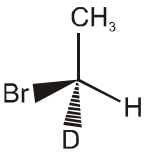
D-2. (I) D (II) (2D, 3D)

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

F-2. (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.

F-3. (i) Enantiomers (ii) Diastereomers (iii) Enantiomers

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 1 gm/mL. Thus specific rotation [α] is

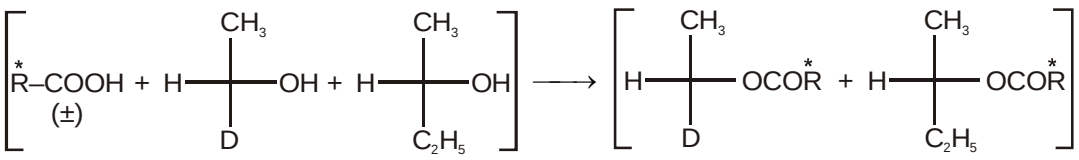
$$[\alpha]_t^{\lambda} = \frac{\theta}{\ell \times C}$$

[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



2-Diastereomer 2-Diastereomer

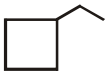
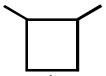
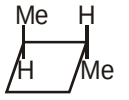
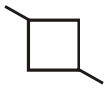
H-1. i, ii, iii, iv

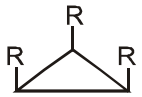
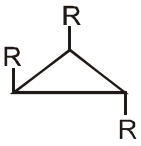
H-2. ii, iii, v, vi

I-1. 3 (oct-2-ene, oct-3-ene, oct-4-ene)

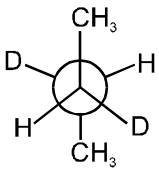
I-2. (I) $CH_3 - \overset{*}{C}H(OH) - CH = \overset{*}{C}H - CH_3$

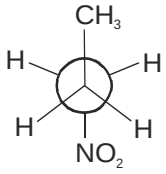
Number of stereocentres = 2 so total number of stereoisomers = $2^2 = 4$
(II) All 4 isomers are optically active.
(III) Total enantiomeric pairs are 2, hence number of fraction will be 2.

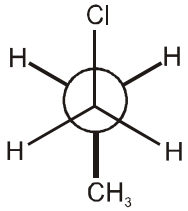
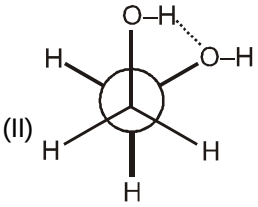
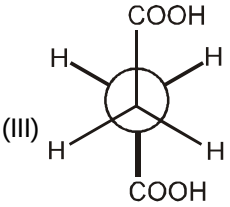
I-3. total=7  
cis

trans(d & ℓ)
 
(cis & trans)

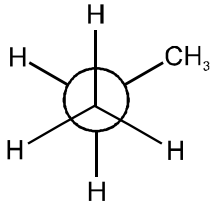
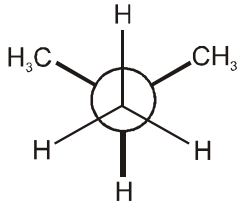
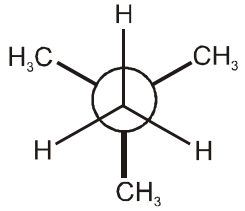
I-4.   (R = COOEt)

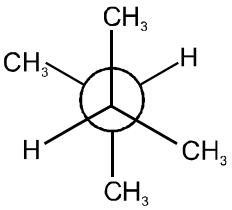
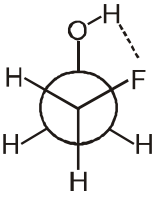
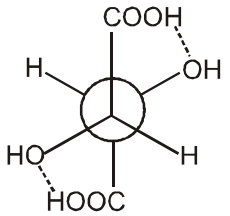
I-5. 6

J-1. 

J-2.  antiform, it is most polar & stable.

J-3. (I)  (II)  (III) 

J-4. (i)  (II)  (iii) 

(iv)  (v)  (vi) 

K-1. (a) cis (b) cis (c) cis (d) trans (e) trans (f) trans

K-2. (i) trans (ii) cis (iii) trans (iv) cis
(v) trans (vi) cis (vii) cis

K-3. First is more stable because of less steric repulsion between groups at equitorial position.

PART-II

A-1.	(C)	**A-2.**	(4)	**A-3.**	(D)	**A-4.**	(A)	**A-5.**	(D)	**B-1.**	(A)	**B-2.**	(D)
C-1.	(B)	**C-2.**	(A)	**C-3.**	(B)	**D-1.**	(C)	**D-2.**	(D)	**D-3.**	(C)	**D-4..**	(4)
D-5.	(C)	**D-6.**	(A)	**D-7.**	(A)	**D-8.**	(A)	**E-1.**	(B)	**E-2.**	(C)	**E-3.**	(A)
F-1.	(A)	**F-2.**	(D)	**F-3.**	(4)	**F-4.**	(D)	**F-5.**	(A)	**F-6.**	(B)	**G-1.**	(B)
G-2.	(B)	**-G3.**	(B)	**G-4.**	(C)	**G-5.**	(A)	**G-6.**	(A)	**G-7.**	(D)	**H-1*.**	(C)
H-2.	(D)	**H-3.**	(A)	**H-4.***	(CD)	**I-1.**	(A)	**I-2.**	(B)	**I-3.**	(B)	**I-4.**	(A)
I-5.	(C)	**I-6.**	(A)	**I-7.**	(D)	**I-8.**	(C)	**I-9.**	(C)	**J-1.**	(C)	**J-2.**	(C)
J-3.	(A)	**J-4.**	(D)	**J-5.**	(C)	**J-6.**	(A)	**J-7.**	(B)	**J-8.**	(C)	**K-1.**	(D)
K-2.	(D)	**K-3.**	(A)	**K-4.**	(A)	**K-5.**	(C)	**K-6.**	(D)				

PART - III

1. (A)→P ; (B)→R ; (C)→Q ; (D)→R
2. (1-S, 2–R, 3–Q, 4–Q)
3. (A)
4. (A - P,S) ; (B - P,S) ; (C - P,S) ; (D - Q,R)

EXERCISE # 2

PART - I

1.	(D)	**2.**	(C)	**3.**	(B)	**4.**	(A)	**5.**	(D)	**6.**	(C)	**7.**	(C)
8.	(B)	**9.**	(C)	**10.**	(A)	**11.**	(D)	**12.**	(B)	**13.**	(A)	**14.**	(B)
15.	(B)												

PART - II

1.	**8**	**2.**	7	**3.**	2	**4.**	4 (i, ii, iii, iv)			**5.**	7. (i, ii, iii, iv, v, viii, ix)		
6.	5 (All geometrical)			**7.**	1 (ii)	**8.**	3 + 1 = 4			**9.**	**5** (iii, v, vi, vii, viii)		
10.	4 (q,r,s,t)			**11.**	25	**12.**	30	**13.**	**4**	**14.**	**6**	**15.**	**4**
16.	**4**	**17.**	**8**	**18.**	12								

PART - III

1.	(A)	**2.**	(AD)	**3.**	(ABC)	**4.**	(CD)	**5.**	(ABD)	**6.**	(ABCD)
7.	(BCD)	**8.**	(BD)	**9.**	(ABC)	**10.**	(ACD)	**11.**	(BC)	**12.**	(ABC)
13.	(ABCD)	**14.**	(ABCD)	**15.**	(AC)						

PART - IV

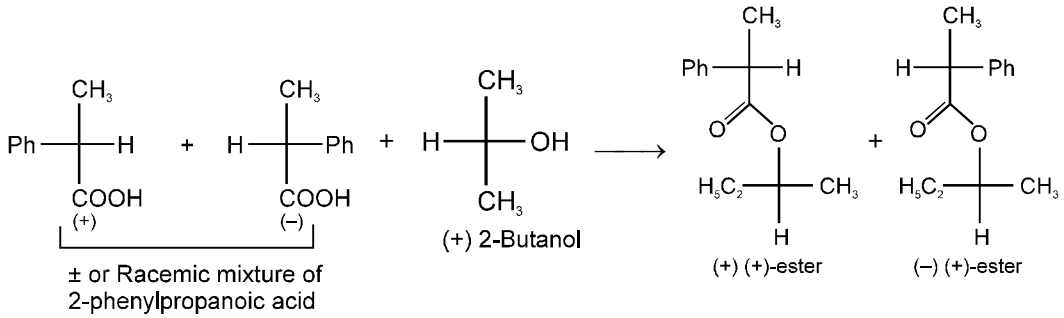
1.	(B)	**2.**	(C)	**3**	(A)	**4**	(A)

EXERCISE # 3

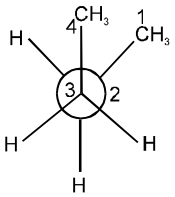
PART - I

1. (A)

2.

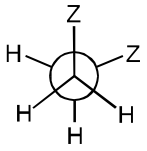


3. Least stable staggered form of n–butane is



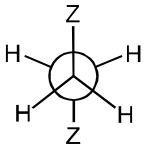
This is due to Vander Waal's strain developed between the methyl groups at C_2 & C_3. There is no torsional strain in the staggered form at torsional angle 60º .

4.



Gauche form

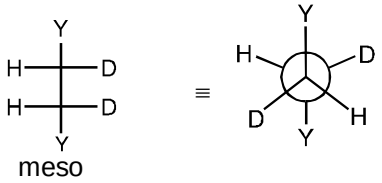
$\mu_{obs} = 1D$



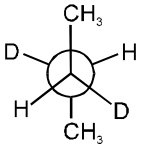
Anti form

$x_{gauche} = 0.18$

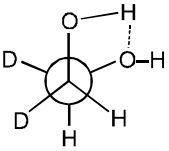
$\Rightarrow \quad \mu_{obs} = \Sigma \mu_i x_i \quad \Rightarrow \quad 1 = \mu_{gauche} \times 0.18 + 0.82 \times 0 \quad \Rightarrow \quad \mu_{gauche} = \dfrac{1}{0.18} = 5.55\ D$



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



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



5.	(C)	**6.***	(AD)	**7.***	(AD)	**8.**	7	**9.***	(BD)	**10.***	(BC)	**11.**	(A)
12.*	(ABC)	**13.**	3	**14.**	2	**15.**	(D)	**16.**	**5**	**17.**	7	**18.**	10.00

PART - II

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

✍ **Marked Questions may have for Revision Questions.**

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

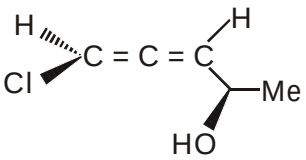
Self Assessment Test

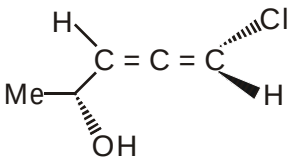
PART- 1 : PAPER JEE (MAIN) PATTERN

SECTION–I : (Maximum Marks : 80)

- This section contains **TWENTY** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in <u>one of the following categories</u> :
  Full Marks : +4 If only the bubble corresponding to the correct option is darkened.
  Zero Marks : 0 If none of the bubbles is darkened.
  Negative Marks : –1 In all other cases

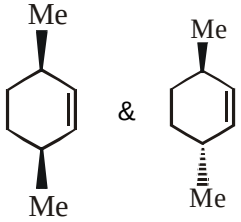
1. The correct relation between the following compounds is :

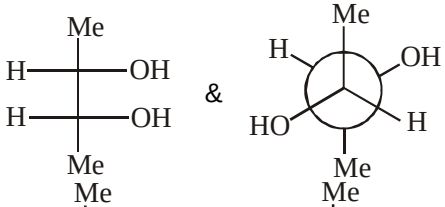


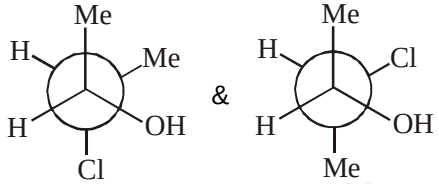


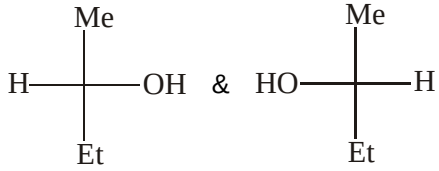
(A) Enantiomers (B) Diastereomers (C) Homomers (Identical) (D) Constitutional isomers

2. Identify incorrect relation between pair of compounds ?

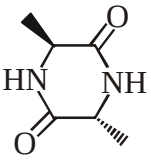
(A)  Diastereomers

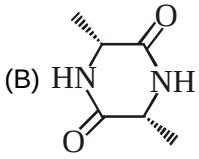
(B)  Enantiomers

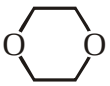
(C)  Diastereomers

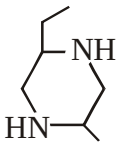
(D)  Enantiomers

3. Which of the following is example of meso compound?

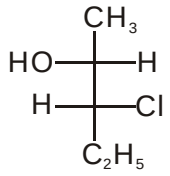
(A) 

(B) 

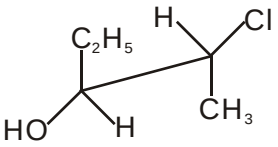
(C) 

(D) 

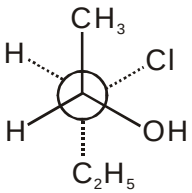
4. The two projection formulae that represent a pair of enantiomers are :-



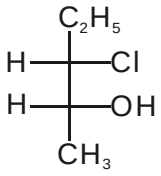
(I)



(II)



(III)



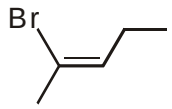
(IV)

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

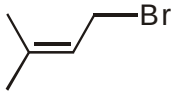
5. Most stable conformation of 1,4-Di(tert-butyl) cyclohexane is
(A) chair (B) Boat (C) Half chair (D) Twist boat

6. Meso-tartaric acid and d-tartaric acid are :-
(A) Positional isomers (B) Enantiomers (C) Diastereomers (D) Racemic mixture

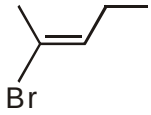
7. Which one of the following statements concerning compounds **V**–**Z** is true ?



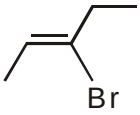
(V)



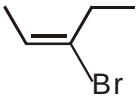
(W)



(X)



(Y)

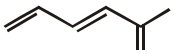


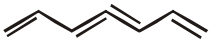
(Z)

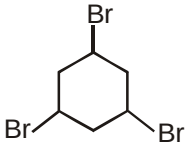
(A) **V** and **X** are conformational isomers
(B) **Y** and **Z** are constitutional isomers
(C) **X** and **Y** are constitutional isomers
(D) **V** and **Y** are stereoisomers

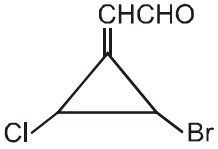
8 Which will not show geometrical isomerism: ?
(A) Maleic acid (B) Fumaric acid (C) Cinnamic acid (D) Salicylic acid

9. Which of the following has highest number of geometrical isomers ?

(A) 

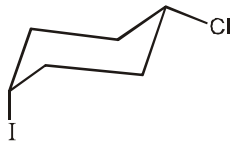
(B) 

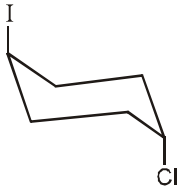
(C) 

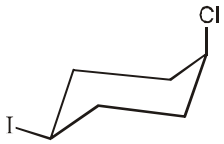
(D) 

10. The most stable form of meso-tartaric acid is
(A) Gauche form (B) Anti form (C) Fully eclipsed form (D) Partially eclipsed

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

(I) 

(II) 

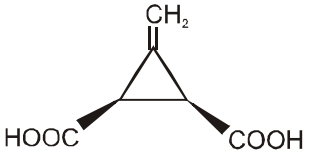
(III) 

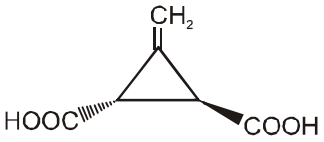
(IV) 

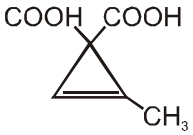
(A) IV > III > I > II (B) IV > I > III > II (C) III > II > I > IV (D) II > I > III > IV

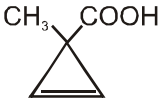
12. Which of the following statement is incorrect ?
(A) Diastereomers can be chiral.
(B) Diastereomers can be achiral.
(C) Enantiomers have similar physical and chemical properties always.
(D) Presence of plane of symmetry confirms optical inactivity.

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

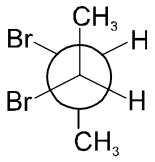
(A) 

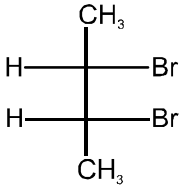
(B) 

(C) 

(D) 

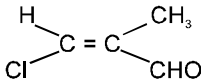
14. Identify the relation between molecules given in Newman and Fischer projections.

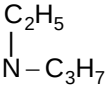


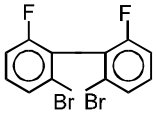


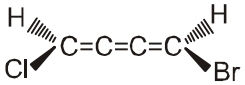
(A) Identical (B) Enantiomers (C) Diastereomers (D) Conformers

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

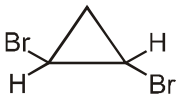
(A) 

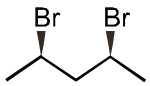
(B) 

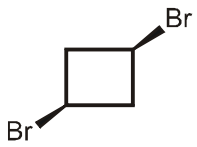
(C) 

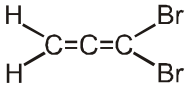
(D) 

16. Identify the chiral species among the following :

(A) 

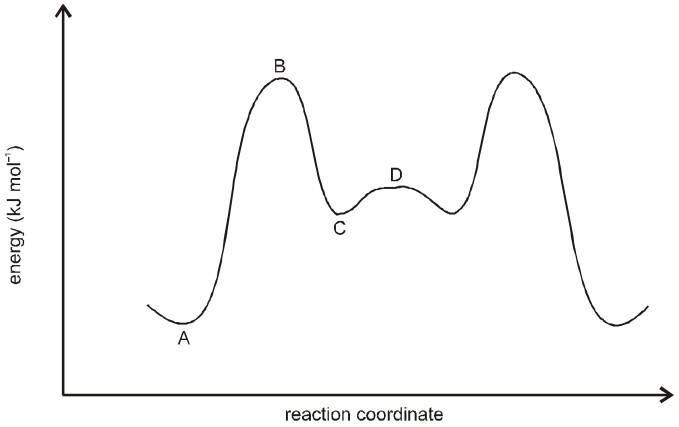
(B) 

(C) 

(D) 

17. The isomeric alcohol which has a chiral carbon atom is :
(A) n-butyl alcohol (B) iso-butyl alcohol (C) sec-butyl alcohol (D) tert-butyl alcohol

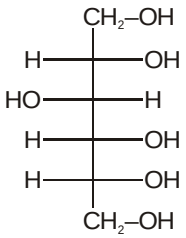
18. In the given energy graph for cyclohexane, the point "B" represent.



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

19. The racemic mixture in liquid/gaseous state will have
(A) Same boiling point as that of its pure enantiomer.
(B) Same refractive index as that of its pure enantiomer.
(C) Same density as that of its pure enantiomer.
(D) All of the above.

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



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

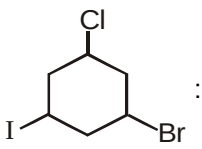
SECTION-II : (Maximum Marks: 20)

- This section contains **FIVE** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places; e.g. 6.25, 7.00, –0.33, –.30, 30.27, –127.30, if answer is 11.36777..... then both 11.36 and 11.37 will be correct) by darken the corresponding bubbles in the ORS.

  For Example : If answer is –77.25, 5.2 then fill the bubbles as follows.
- Answer to each question will be evaluated according to the following marking scheme:

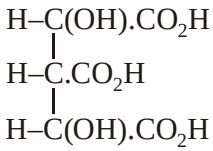
  Full Marks : +4 If ONLY the correct numerical value is entered as answer.

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

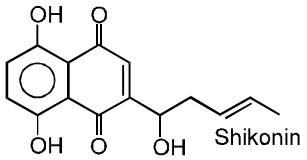
22. How many geometrical isomers are possible for 
 :

23. The number of optically active compounds in the isomers of C_4H_9Br is :

24. How many stereoisomers can exist for the following acid.



25. How many stereoisomers of shikonin (a drug for healing of wounds) are possible?



PART 2 : PAPER JEE (ADVANCED) PATTERN

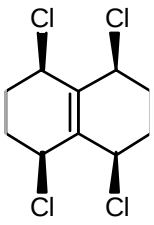
SECTION-I : (Maximum Marks : 12)

- This section contains **FOUR** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories :

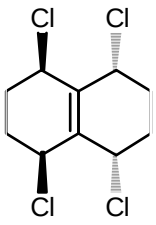
Full Marks	: +3	If only the bubble corresponding to the correct option is darkened.
Zero Marks	: 0	If none of the bubbles is darkened.
Negative Marks	: –1	In all other cases

1. Which of the following has maximum number of two-fold axis of symmetry.
(A) Ethylene (B) Cyclopropane (C) Cyclobutane (D) Benzene

2. The following compounds are :



(I)

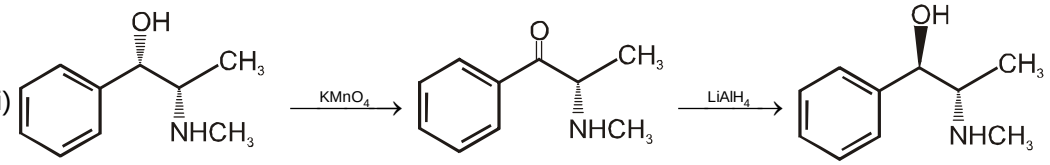


(II)

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

3. Which conformation of Bicyclo [2, 2, 2]-octane is more stable ?
(A) Chair (B) Half Boat (C) Boat (D) Twisted boat

4. Pseudoephedrine is a constituent in many common drugs against cold used nasal sprays.
Observe the chemical reactions given here and select the correct relation-

(iii) 

(A) (B) (C)

Statements concerning isomers :-

(A) 1 and 3 are stereo isomers (B) 1 and 3 are Enantiomers

(C) 1 and 3 are diastereomers (D) 1 and 3 are conformations

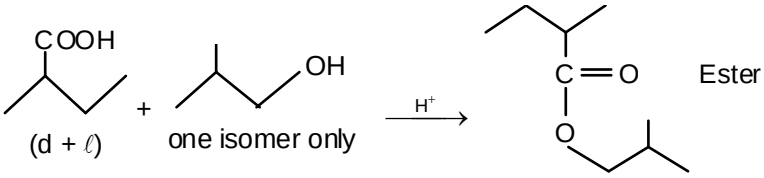
SECTION-II : (Maximum Marks: 32)

- This section contains **EIGHT** questions.
- Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).
- For each question, choose the correct option(s) to answer the question.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks	: +4	If only (all) the correct option(s) is (are) chosen.
Partial Marks	: +3	If all the four options are correct but ONLY three options are chosen.
Partial Marks	: +2	If three or more options are correct but ONLY two options are chosen, both of which are correct options.
Partial Marks	: +1	If two or more options are correct but ONLY one option is chosen and it is a correct option.
Zero Marks	: 0	If none of the options is chosen (i.e. the question is unanswered).
Negative Marks	: –1	In all other cases.

- **For Example :** If first, third and fourth are the **ONLY** three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(s) (second option in this case), with or without selection of any correct option(s) will result in –1 marks.

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



(d + ℓ) one isomer only

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

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

6. 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

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

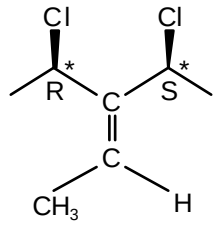
(A) Anti conformation of $H_2N–CH_2–CH_2–NH_2$ is always more stable than its Gauche confromation.

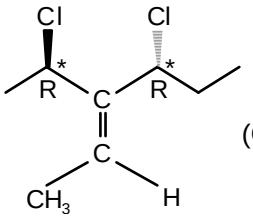
(B) Gauche conformation of $HO–CH_2–CH_2F$ is more stable than its anti conformation at room temperature.

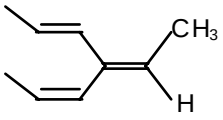
(C) On increasing temperature, dipole moment of pure $Cl–CH_2–CH_2–Cl$ increases.

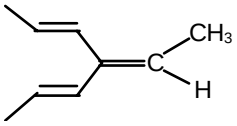
(D) In case of 1,4-Dihydroxycyclohexane twisted boat conformer is most stable.

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

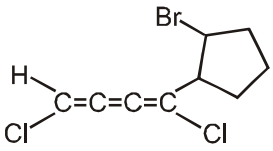
(A) 

(B) 

(C) 

(D) 

9. Which of the following compounds is capable of showing geometrical, optical and conformational isomerism.

(A) 

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

(C) $CH_3–CH=CH–CH_2–CH_2–OH$

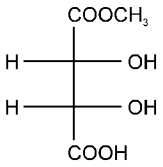
(D) $H_2C=CH–CH_2–OH$

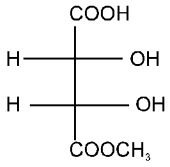
10. Which of the following has/have potential energy diagram for conformations closely resembling to ethane?

(A) 2,2-Dimethylpropane (B) 2,3-Dimethylbutane

(C) Propane (D) 2,2-Dimethylbutane

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

(I) 

(II) 

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

12. 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.

SECTION-III : (Maximum Marks: 18)

- This section contains **SIX** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the **second decimal place**; e.g. 6.25, 7.00, –0.33, –.30, 30.27, –127.30, if answer is 11.36777..... then both 11.36 and 11.37 will be correct) by darken the corresponding bubbles in the ORS.

  For Example : If answer is –77.25, 5.2 then fill the bubbles as follows.
- Answer to each question will be evaluated according to the following marking scheme:

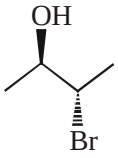
  Full Marks : +3 If ONLY the correct numerical value is entered as answer.

  Zero Marks : 0 In all other cases.

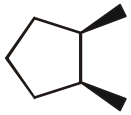
13. Calculate the number of Benzenoid isomers possible for C_6H_3ClBrI.

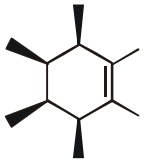
14. How many of the given compounds are chiral :

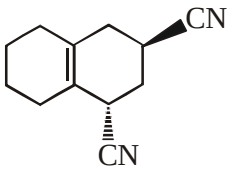
(i) 

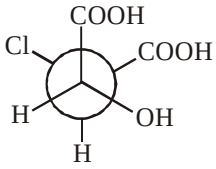
(ii) 

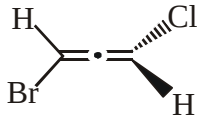
(iii) 

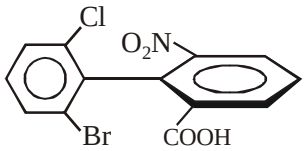
(iv) 

(v) 

(vi) 

(vii) 

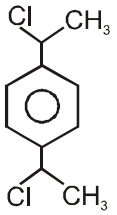
(viii) 

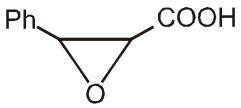
(ix) 

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

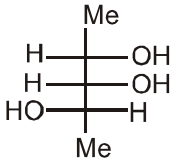


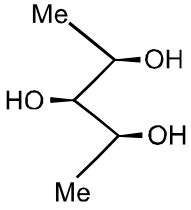
18. Sum of total no. of stereoisomers (A) and total no. of fractions (B) for the compound 

is

PART - 3 : OLYMPIAD (PREVIOUS YEARS)

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





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

2. 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.

3. How many optically active stereoisomers are possible for Butane-2,3-diol ? **[NSEC-2004]**
(A) 1 (B) 2 (C) 3 (D) 4.

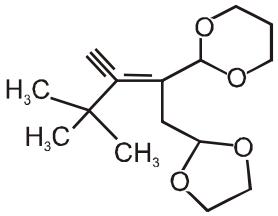
4. The compound that will not be able to exhibit stereoisomerism is : **[NSEC-2006]**
(A) 1,2 - Dibromocyclopropane (B) Lactic acid
(C) 1-Bromopropene (D) Methylcyclopropane.

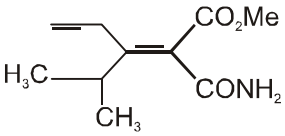
5. How many different alcohols (not including optical isomers) are possible with the molecular formula : $C_4H_{10}O$? **[NSEC-2006]**
(A) 3 (B) 4 (C) 5 (D) 6

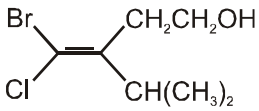
6. A compound is chiral even if **[NSEC-2006]**
(A) a mirror plane is present (B) a centre of inversion exists
(C) a rotation axis exists (D) an improper rotation axis is present.

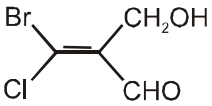
7. The achiral species among the following is : **[NSEC-2007]**
(A) a car (B) a screw driver (C) a screw (D) a hand

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

(A) 

(B) 

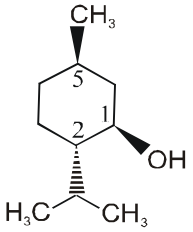
(C) 

(D) 

9. The following symmetry element is present in the d as will as the ℓ from 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

10. 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

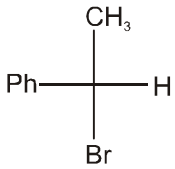
11. The absolute configurations of the chiral centres 1, 2 and 5 in the following molecule are **[NSEC-2009]**



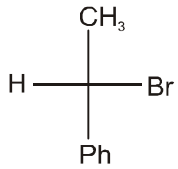
(A) 1R, 2R, 5R (B) 1S, 2S, 5S (C) 1R, 2S, 5R (D) 1S, 2R, 5S

12. 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.

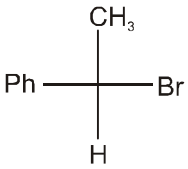
13. The pair of enantiomers among the following compound are : **[NSEC-2009]**



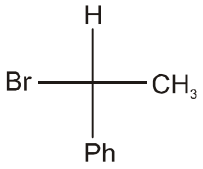
I



II



III



IV

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

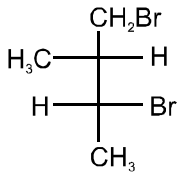
14. The number of all types of isomers of chlorobutane is **[NSEC-2010]**
(A) 2. (B) 4 (C) 6 (D) 5

15. (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

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

17. 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

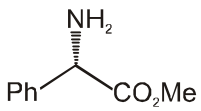
18. The **R/S** designation for the following stereoisomer of 1,3-Dibromo-2-methylbutane is : **[NSEC-2012]**

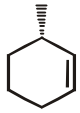


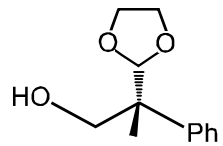
(A) 2R, 3R (B) 2R, 3S (C) 2S, 3R (D) 2S, 3S

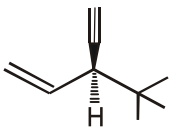
19. Among the isomers of Dimethylcyclohexanes, the chiral ones are **[NSEC-2012]**
(A) 1, 2-trans and1, 3-cis (B) 1, 2-cis and 1,3-trans
(C) 1, 3-trans and 1, 4-trans (D) 1, 2-trans and 1,3-trans

20. Which one of the following compound has R configuration ? **[NSEC-2012-13]**

I. 

II. 

III. 

IV. 

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

RRP ANSWER KEY

PART- 1

1.	(C)	**2.**	(B)	**3.**	(A)	**4.**	(C)	**5.**	(A)	**6.**	(C)	**7.**	(C)
8	(D)	**9.**	(D)	**10.**	(B)	**11.**	(A)	**12.**	(C)	**13.**	(B)	**14.**	(C)
15.	(C)	**16.**	(A)	**17.**	(C)	**18.**	(B)	**19.**	(D)	**20.**	(C)	**21.**	3
22.	4	**23.**	2	**24.**	4	**25.**	4						

PART - 2

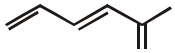
1.	(D)	**2.**	(C)	**3.**	(C)	**4.**	(A)	**5.**	(ABD)	**6.**	(ABCD)
7.	(BC)	**8.**	(ACD)	**9.**	(1)	**10.**	(ACD)	**11.**	(CD)	**12.**	(ACD)
13.	10	**14.**	**(6)**	**15.**	25%	**16.**	0				
17.	3.	**18.**	6								

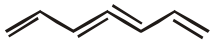
PART - 3

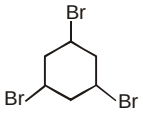
1.	(C)	**2.**	(A)	**3.**	(B)	**4.**	(D)	**5.**	(B)	**6.**	(C)	**7.**	(B)
8.	(B)	**9.**	(B)	**10.**	(A)	**11.**	(C)	**12.**	(D)	**13.**	(C)	**14.**	(D)
15.	(D)	**16.**	(C)	**17.**	(C)	**18.**	(A)	**19.**	(D)	**20.**	(D)		

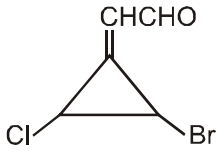
RRP SOLUTIONS

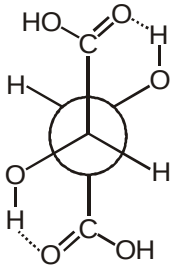
PART- 1

9.  geometrical isomers = 2

 geometrical isomers = 0

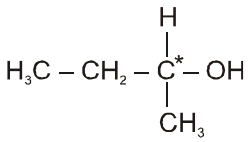
 geometrical isomers = 2

 geometrical isomers = 4

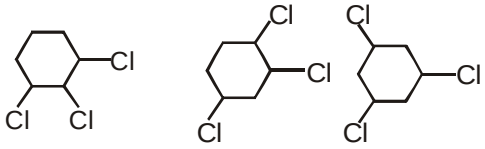
10.  (Anti form)

14. Compounds are diastereomers.

15. 2, 2`6, 6` tetra substituted biphenyls are optically active

17. 

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

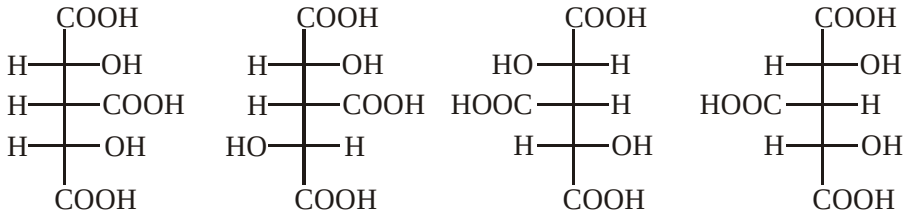
21. 

23. $C_4H_9Br \Rightarrow CH_3-CH_2-CH_2-\underset{Br}{CH_2}$, $CH_3-CH_2-\overset{*}{\underset{Br}{C}}H-CH_3$, $CH_3-\underset{Br}{\overset{CH_3}{C}}-CH_3$, $CH_3-\underset{Br}{\overset{CH_3}{C}}H-CH_2$

(Optically active)

Optically active isomers $\Rightarrow$ 2

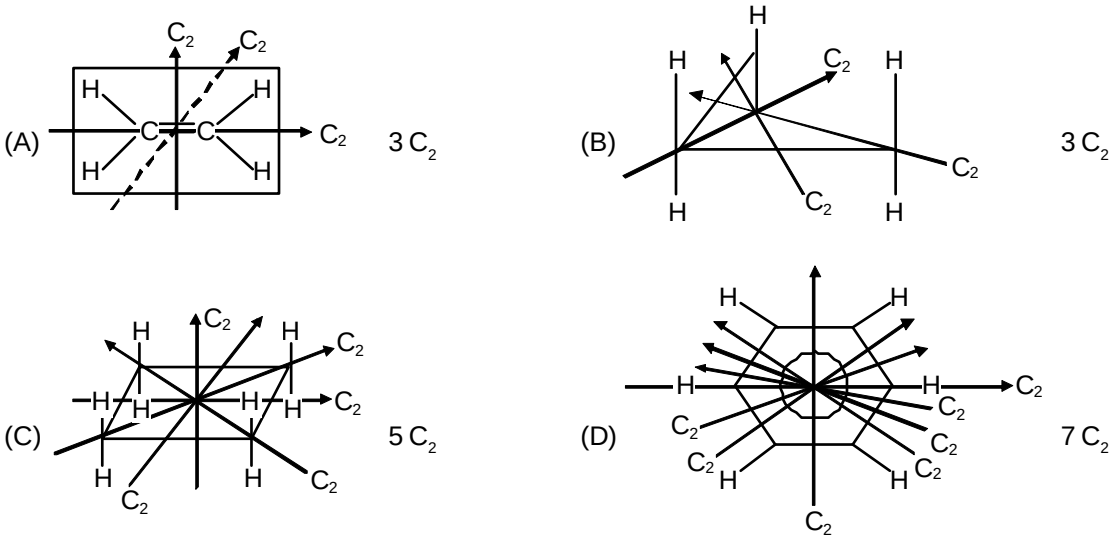
24.



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

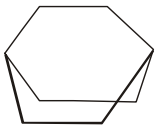
PART 2

1.

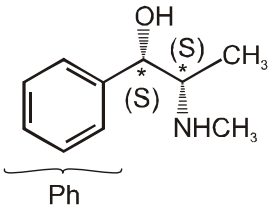


2. Compound (I) and (II) are diastereomer

3.



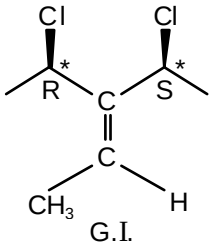
4. (I)



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

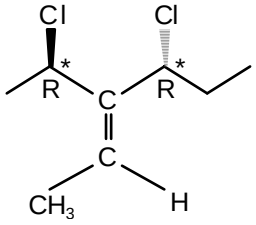
7. Due to Hydrogen bonding Gauche conformation of $H_2N–CH_2–CH_2–NH_2$ and $HO–CH_2–CH_2–F$ are more stable than anti conformations.
In case of $ClCH_2CH_2Cl$ on increasing temperature % of Gauche conformation increases. Hence dipole moment increases. In case of option (D) boat conformation is more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

8. (A)

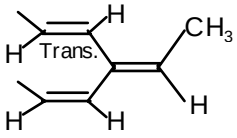


G.I.

(B)

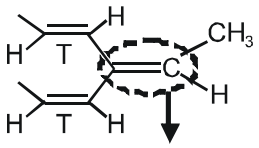


(C)



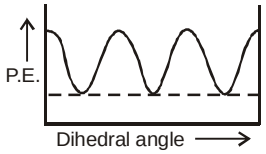
Cis

(D)



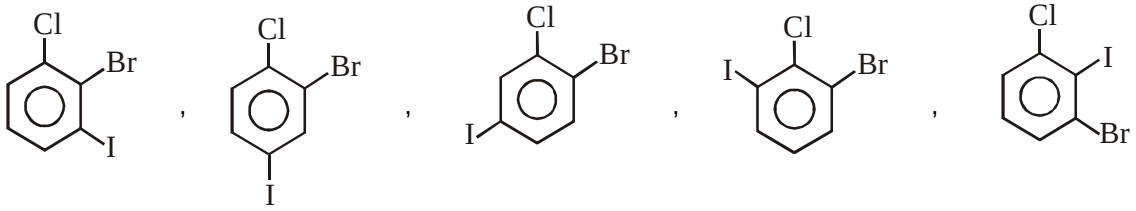
pesudo stereo centre exists

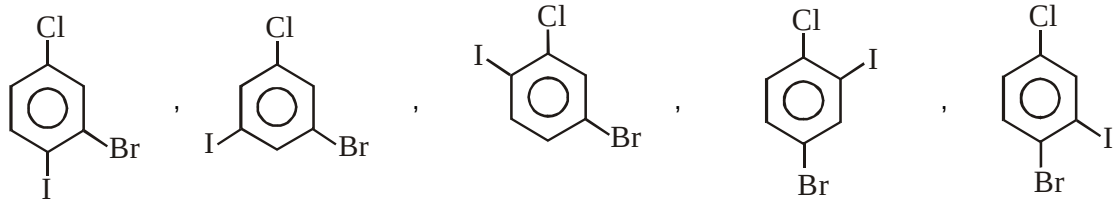
10. A,C,D have the P.E. diagram like



11. (I) and (II) are enantiomers

13.





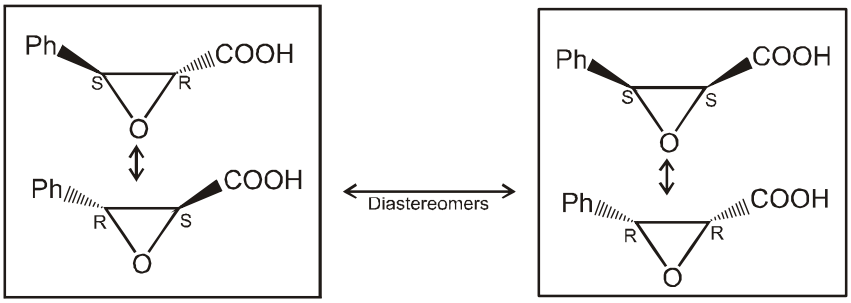
15. Enatiomeric excess = $\frac{\text{observed rotation}}{\text{specific rotation of pure enantiomer}} = \frac{-50°}{-100°} \times 100 = 50\%$

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

16. Zero (as none of its stereoisomer is chiral)

17. A = 1, B = 2,
A + B = 3.

18. 4 + 2 = 6

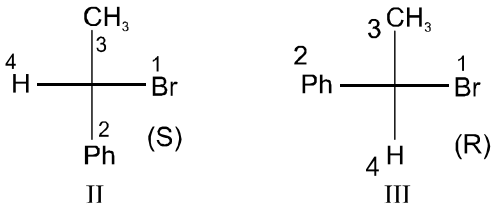


Enantiomers Enantiomers

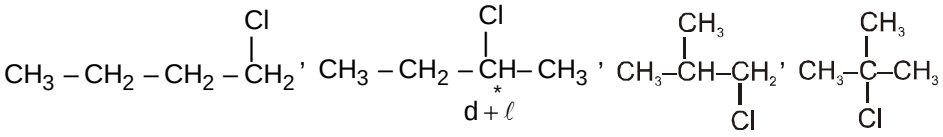
PART - 3

12. Due to restricted rotation with two disimilar groups around C = C bond.

13.



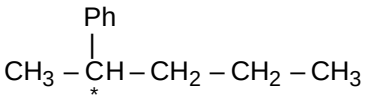
14. **(D)** Chlrorobutane



Overall 5 isomers

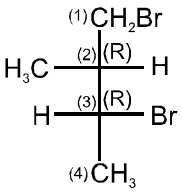
15. Geometrical isomer for (i) = 0, (ii) = 2, (iii) = 3.

16. Only (C) has asymmetric carbon atom.



17. CH_3–CH=CH–CH(Br)CH_3 has 4 stereo isomers, with (Z, R), (Z, S), (E, R) and (E, S) configuration.

18. The given structure has 2R, 3R designation.



19. trans-1,2-dimethylcyclohexane and trans-1,3-dimethylcyclohexaner are chiral.

20.