Exercise-1

Marked Questions may have for Revision Questions.

OBJECTIVE QUESTIONS

Section (A) : Geometrical isomerism

A-1. **Sol.** Stereoisomers have same connectivity of atoms but different orientations (configurations) in space.

A-2. **Sol.** Follow conditions of geometrical isomerism.

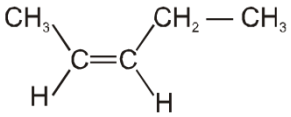
A-3. **Sol.** Follow conditions of geometrical isomerism.

A-4. **Sol.** Follow conditions of geometrical isomerism.

A-5. **Sol.** Follow conditions of geometrical isomerism.

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

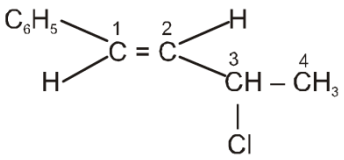
B-1. **Sol.** (Z) -2-pentene



[Senior groups at same side of restricted rotation]

B-2. **Sol.** E-isomers have senior groups on anti-orientation.

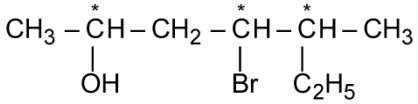
B-3. **Sol.**



trans-3-chloro-1-phenyl but-1-ene.

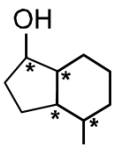
Section (C) : Chiral carbon and Projection Formula

C-2. **Sol.**



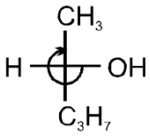
has three chiral carbons.

C-3. **Sol.**

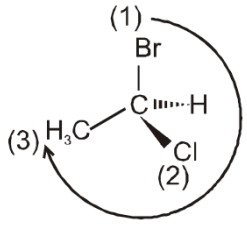


Four chiral carbon atoms

Section (D) : Configurational nomenclature in optical isomers :

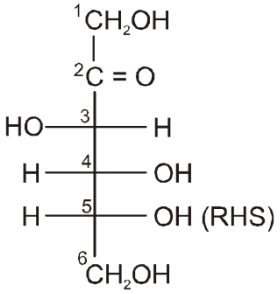


D-1. **Sol.** the arrow is clockwise but least priority group is on horizontal line of fischer projection.



D-2. **Sol.** R.

D-3. **Sol.** First decide the (R/S) configuration in wedge-dash and then draw fischer projection for same configuration.



D-6. **Sol.** (D-Configuration)

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

F-5. **Sol.** Meso compound has atleast 2-chiral carbon.

Section (G) : Plane polarized light, specific rotation, observed rotation, optical purity and enantiomeric excess

G-2. **Ans.** + 12 unit

Sol. (2) +12 unit Since specific rotation [α] is independent of ℓ, C.

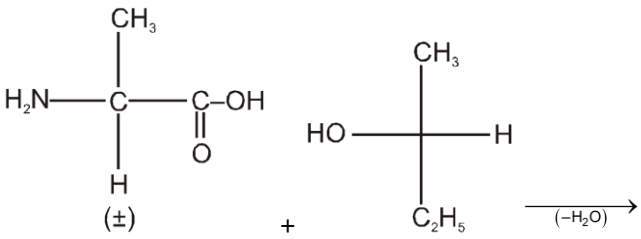
G-3. **Sol.** % Enantiomeric excess = $\frac{\text{Excess of one enantiomer over other}}{\text{Entire mixture}} \times 100$

$= \frac{6-4}{6+4} \times 100 = 20\%$

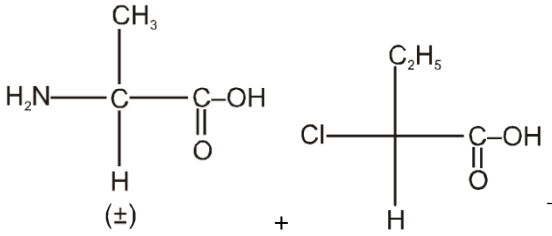
% optical purity = $\frac{[\alpha]_{\text{observed}}}{[\alpha]_{\text{pure}}} \times 100 \Rightarrow 20 = \frac{[\alpha]_{\text{observed}}}{13.5} \times 100 \Rightarrow$ [α] observed = + 2.7

Section (H) : Racemic mixture, Optical Resolution

H-1. **Sol.**



two diastereomeric esters

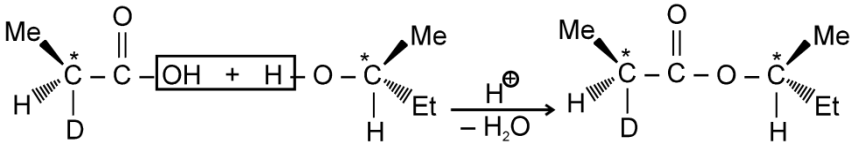


two diastereomeric amides

(–) –2–chlorobutanoicacid

Racemic mixture can be resolved by using optically active compounds.

H-2. **Sol.(1)**



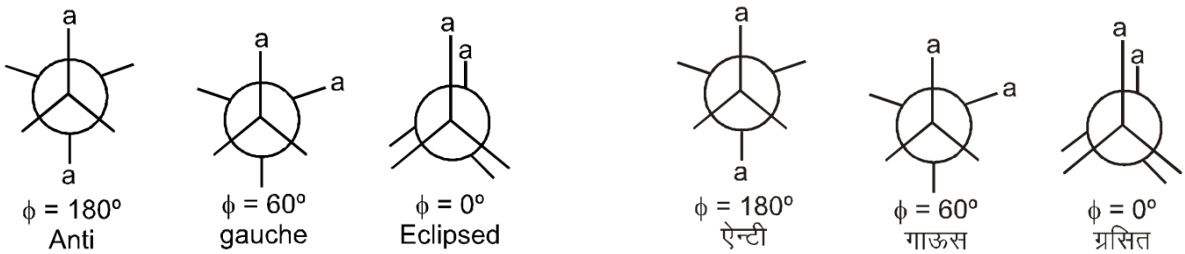
Since carbocation does not form any chiral carbon in this reactions hence racemic mixture can not form.

H-3. **Sol.** Enatiomers have same physical properties so they can not be separated by any physical method which diastereomers have different physical properties.

Section (I) : Conformations, strains and stability

I-1.

Sol.



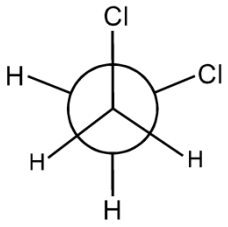
I-2. **Sol.** The eclipsed and staggered conformation of ethane is due to free rotation about C — C single bond.

I-4. **Sol.** Deviation in normal bond angles increases the angle strain. In cyclopropane deviation in bond angle is maximum.

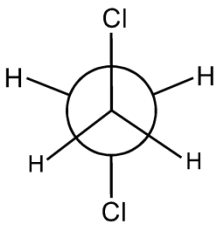
Section (J) : Conformational analysis of Ethane, Propane, Butane and Substituted butane

J-1. **Sol.** Anti form of butane is more stable because of less strains.

J-4. **Hint :** $Cl - CH_2 - CH_2 - Cl$ has two staggered conformations.



Gauche form

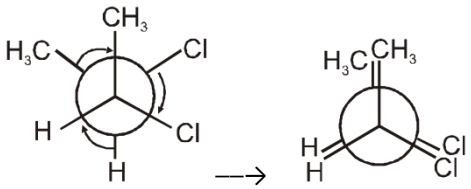


Anti form

Only Gauche form is polar. Anti form is nonpolar.

J-5.

Sol. (1) is meso form so it is achiral molecule



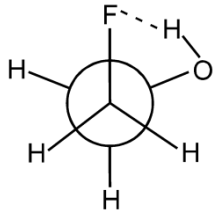
Meso form

J-6. **Sol.** X = Hydrogen Y = $-CH(CH_3)_2$

Section (K) : Conformational analysis of compound having intramolecular H-bonding.

K-1.

Sol.



Although steric repulsion exist but hydrogen bonding as shown above, gives stability to the gauche form.

K-2. **Sol.** Gauche form of butane-2,3-diol has intramolecular H-bonding. So it is most stable.

K-5. **Sol.** Both are meso compounds (achiral) and identical with its mirror image.

Section (M) : Calculation of stereoisomers

M-1. **Sol.** Unsymmetrical compound with 2 stereocentres has 4 geometrical isomers ($2^2 = 4$).

M-2. Sol. Unsymmetrical compound with 2 stereocentres has 4 geometrical isomers.

M-3. Sol. Unsymmetrical compound with 2 stereocentres has 4 geometrical isomers.

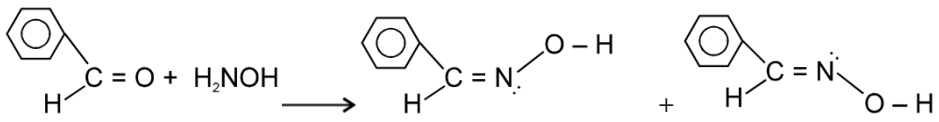
M-4. Sol. Unsymmetrical compound with 2 stereocentres has 4 geometrical isomers.

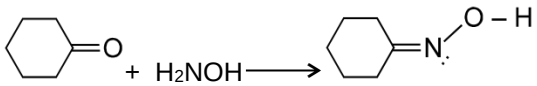
M-5. Sol. Geometrical isomers for symmetrical compounds = $2^{n-1} + 2^{\frac{n-1}{2}}$

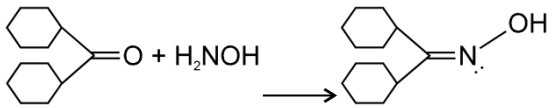
n = 3, total G.I. = 6

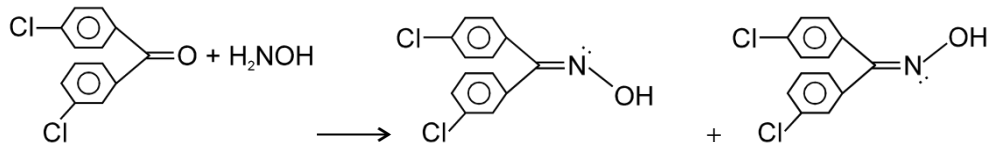
M-6. Sol. Number of geometical centres (n) = 4. So, total G.I. = $2^4 = 16$

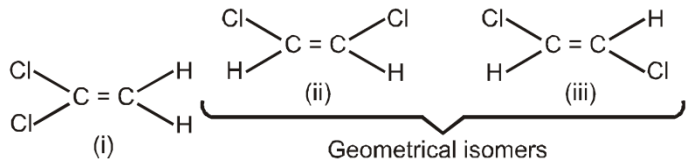
M-8. Sol.

(I) 

(II) 

(III) 

(IV) 

M-9. Sol. 

,

⇒ Total no. isomers are 3.

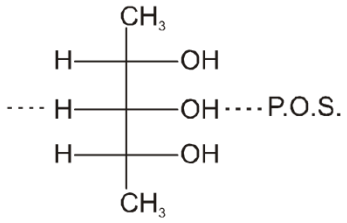
⇒ C is sp^2 hybridised in each isomer, therefore geometry is trigonal planar.

M-10. Sol. Unsymmetrical compound with 2 chiral centres has $2^2 = 4$ stereoisomers.

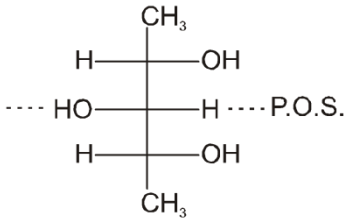
M-11. Sol. Symmetrical compound with three chiral centres has $2^{n-1} = 2^{3-1} = 4$ stereoisomers.

M-12. Sol. Unsymmetrical compound with three chiral centres has $2^n = 2^3 = 8$ stereoisomers.

M-13. Sol. 2, 3, 4 -pentanetriol

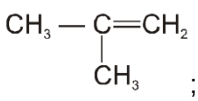


(Meso-I)



(Meso-II)

M-14. Sol. C_4H_8 (D.U. = 1) ; Total isomers = 6

$H_3C–H_2C–CH=CH_2$; $CH_3–CH=CH–CH_3$ (cis/trans.) ;  ;  ; 

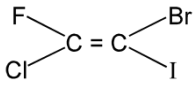
Exercise-2

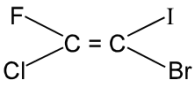
Marked Questions may have for Revision Questions.

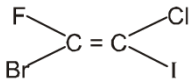
PART - I : OBJECTIVE QUESTIONS

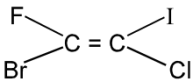
3. Sol. Size and number of groups are less then torsional energy is minimum.

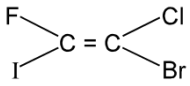
7. Sol. Molecule $C_2BrClFI$ shows geometrical isomerism as E & Z-isomers.

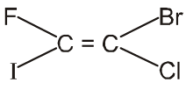

I (Z-isomer)


II (E-isomer) = 2


I (Z-isomer)


II (E-isomer) = 2


I (Z-isomer)

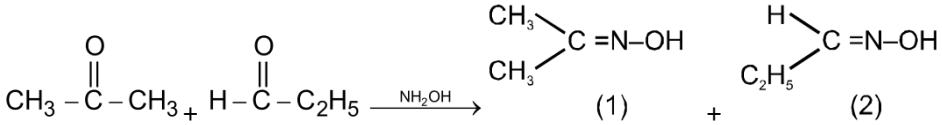

II (E-isomer) = 2

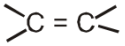
Hence total isomers are six.

8. Ans. 3 (oct-2-ene, oct-3-ene, oct-4-ene)

9. Sol. $Ph–CH=CH–CH=O \xrightarrow{NH_2OH} Ph–CH=CH–CH=N–OH$

Total geometrical centers = 2. So total geometrical isomers = $2^2 = 4$

10. Sol. 

11. Sol. Have 8 spatial orientation due to chiral C,  bond & along 2, 2′, 6, 6′ biphenyl.

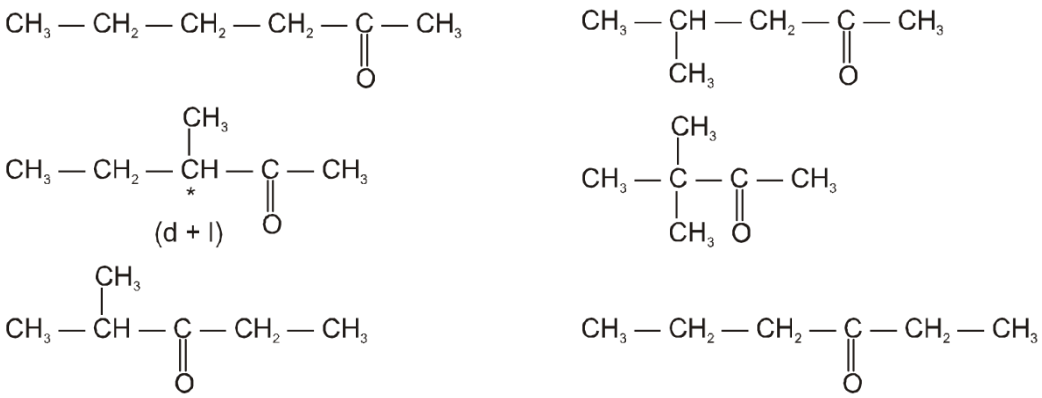
12. Sol. (1) Plane of symmetry; (2) C_2 axis symmetry; (3) Centre of symmetry ;

(4) Plane of symmetry

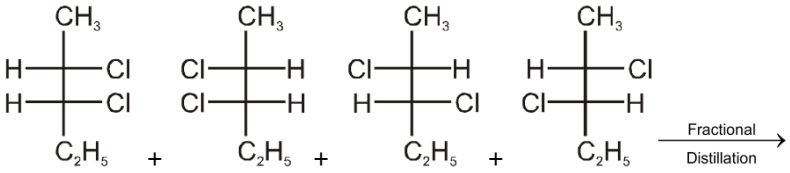
13. **Sol.** Number of optically active stereoisomers of tartaric acid = 2.

14. **Sol.** $C_6H_{12}O$

D.U. = 1

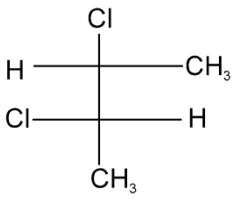


∴ Total no. of ketones = 7

15. **Sol.**  Fraction$_1$ (I+II) + fraction$_2$ (III + IV).

16. **Sol.** Number of D stereoisomers = 4.

18. **Sol.** Number of optically active stereoisomers = 4 and total stereoisomers = 6.

19. **Sol.** Compound  is a meso compound hence it has zero optical rotation.

20. **Sol.** Total no. of stereocentres (n) = 4

Total no. of optical isomers = $2^n = 2^4 = 16$

PART - II : MISCELLANEOUS QUESTIONS

Section (A) : ASSERTION/REASONING

A-1. **Ans.** (4)

A-2. **Ans.** (1)

Sol. Meso tartaric acid is optically inactive and it has plane of symmetry.

A-3. **Ans.** (4)

A-4. Ans. (1)

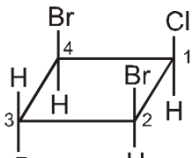
Sol. Boiling points of isomeric compounds depends on dipole-dipole interactions and cis- isomers have greater dipole moments (more polar) than trans-isomers (less polar) generally.

Section (B) : MATCH THE COLUMN

Note : Only one answer type (1 × 1)

B-1. **Ans.** (A - p) ; (B - p) ; (C - s) ; (D - r)

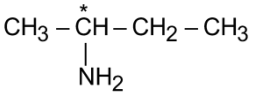
Section (C) : ONE OR MORE THAN ONE OPTIONS CORRECT

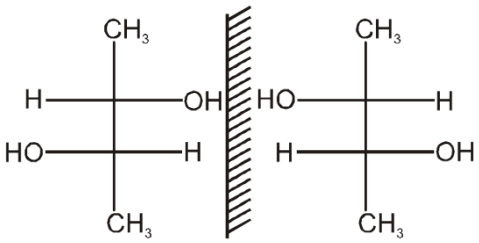
C-2. **Sol.** This structure 

has plane of symmetry across 1-3 but there is no centre of symmetry.

C-3. **Sol.** Compound which has chiral carbon can show enantiomerism.

C-4. **Sol.** Since total two products are formed hence both carbonyl should be symmetrical.

C-5. **Sol.**  has chiral carbon.

C-6. **Sol.** 

non-super imposible mirror image stereoisomers.

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

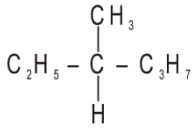
OFFLINE JEE-MAIN

1. **Sol.** An equimolar mixture of two i.e., dextro and laevorotatory optical isomers is termed as racemic mixture or dl form or (±) mixture.

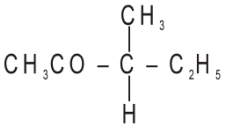
2. **Sol.** $Cl_2–C=CH–CH_2–CH_2–CH_3$

Identical groups (Cl) on C-I will give only one compound.

3. **Sol.** A chiral object or compound can be defined as the one that is not superimposable on its mirror image, or we can say that all the four groups attached to a carbon atom must be different. only I and II are chiral compounds.

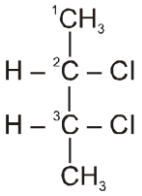


(I)

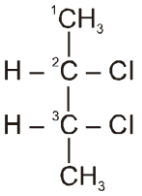


(II)

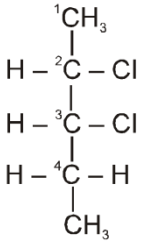
4. **Sol.**



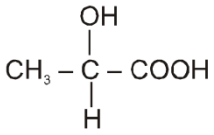
2,3-Dichlorobutane



2,3-Dichlorobutane



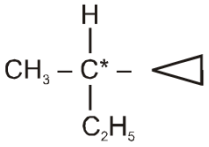
2,3-Dichloropentane



2-hydroxypropanoic acid

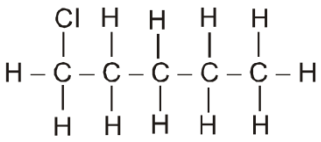
2,3-dichlorobutane have meso isomer due to the presence of plane of symmetry.

5. **Sol.**

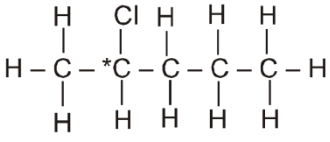


Optically active due to presence of chiral carbon atom .

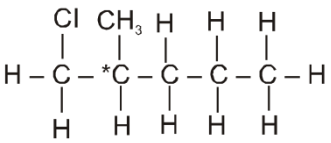
6. **Sol.** To be optically active the compound or structure should possess chiral or asymmetric centre but in the rest of the structure it is present.



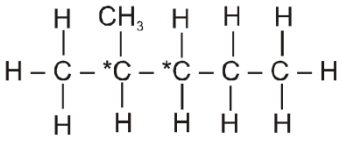
1-chloropentane



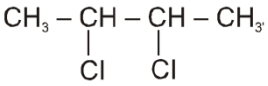
2-chloropentane



1-chloro-2-methyl pentane

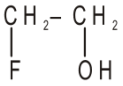


3-chloro-2-methyl pentane

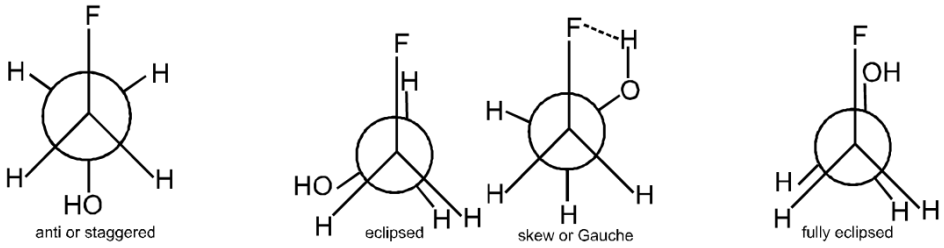


7. **Sol.** Due to presence of two asymmetric carbon atoms in 2, 3-dichlorobutane, it exhibits optical isomerism.

8. **Sol.**



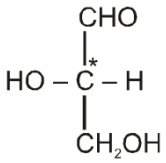
2-fluoroethanol



anti or staggered eclipsed skew or Gauche fully eclipsed

Gauche form is more stable due to intramolecular H-bonding

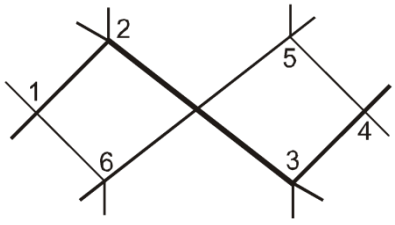
9.



Sol.

Due to the presence of chiral carbon atom it is optically active, hence it is expected to rotate plane of polarized light.

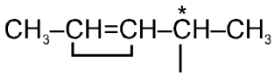
10. **Sol.** The twist boat conformation of cyclohexane is optically active as it does not have any plane of symmetry



11. **Sol.** According to CIP rule first decide the seniority of groups and than decide the configuration.

12. **Sol.** $CH_3–CH=CH–CH_3$

2-butene



13. **Sol.** Total possible isomers are four.

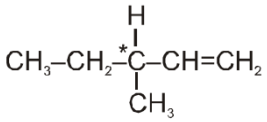
cis – R

trans – R

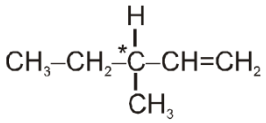
cis – S

trans – S

14.



3-Methyl-1-pentene

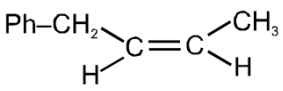


3-मेथिल-1-पेन्टीन

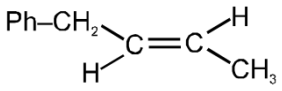
Sol. It is optical active since it has chiral carbon atom.

15. **Sol.** Molecules with restricted rotation and having two different groups on both restricted atoms can show geometrical isomerism.

1 - Phenyl - 2- butene ($Ph–CH_2–CH=CH–CH_3$)

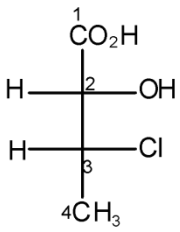


(cis)

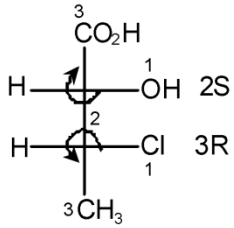


(trans)

16. **Ans.** (1)



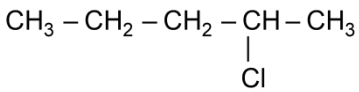
IUPAC numbering



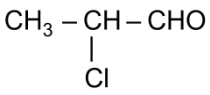
Numbering according to CIP rules for R/S naming

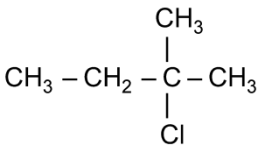
Sol.

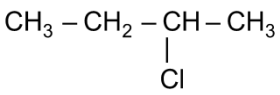
ONLINE JEE-MAIN



2. **Sol.**







3. **Sol.** Both valences are identical in I.

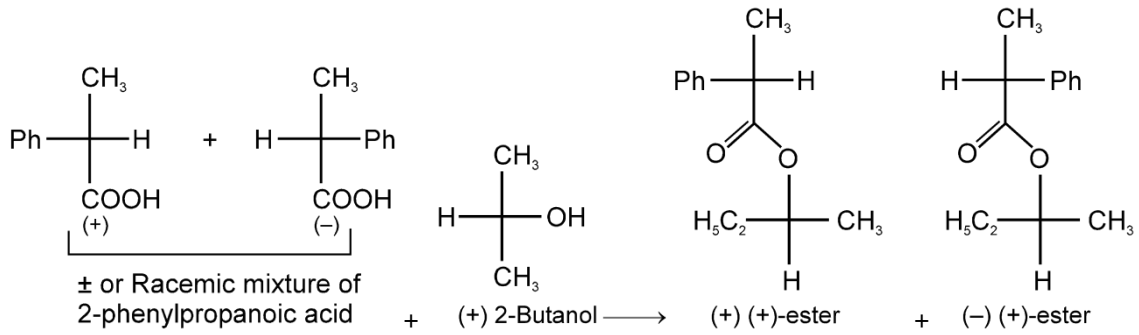
PART - II : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)

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

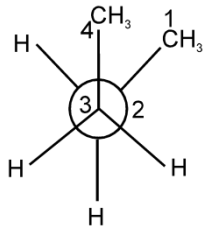
1. **Ans.** When optically active acid reacts with racemic mixture of an alcohol, it forms two types of isomeric esters. In each the configuration of the chiral centre of acid will remain the same. So the mixture will be optically active.

2.

Sol.



3. **Sol.** Least stable staggered form of n–butane is



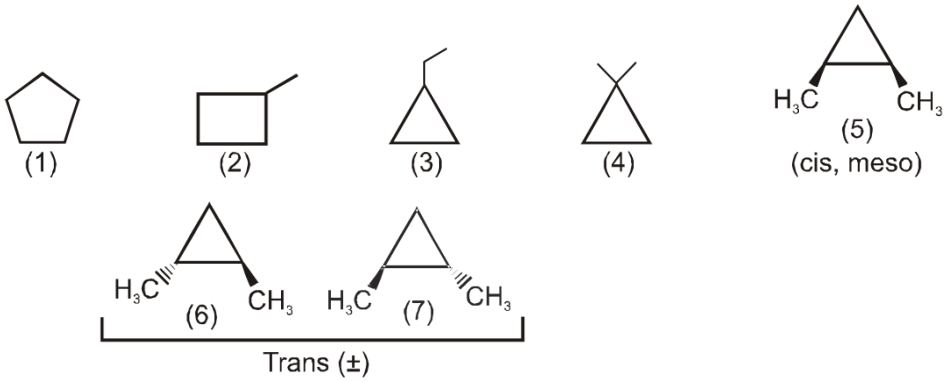
This is due to Vander Waal's strain developed between the methyl groups at C_2 & C_3. There is no torsional strain in the staggered form at torsional angle 60º .

7. **Sol.** (X) has configurations

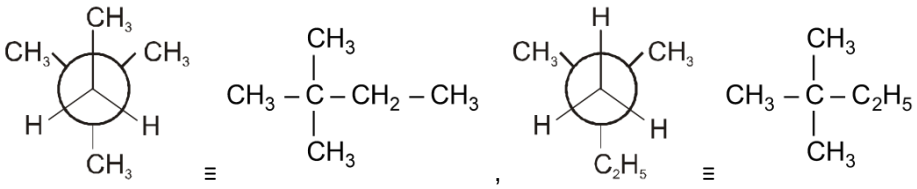
(1) R Z R (2) S Z S (3) R Z S (4) R E R (5) S E S (6) R E S

8. **Ans.** 7

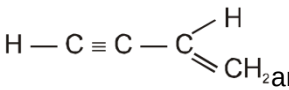
Sol.



9.* Sol.



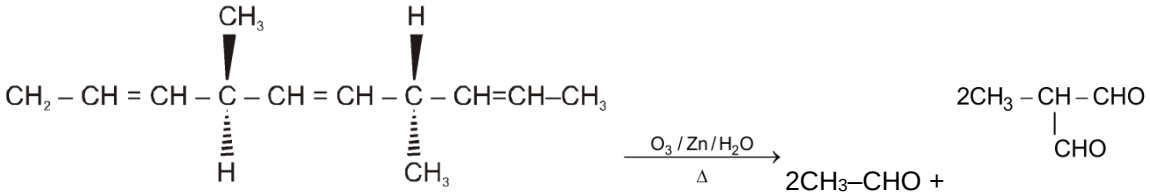
10.* Sol. In (B)



and (C) $CH_2 == C == O$ all atoms are always in same plane.

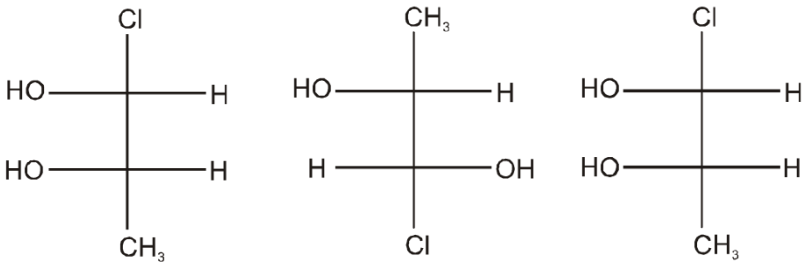
11.

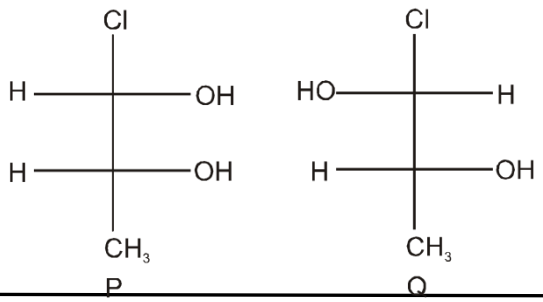
Sol.



All optically inactive products

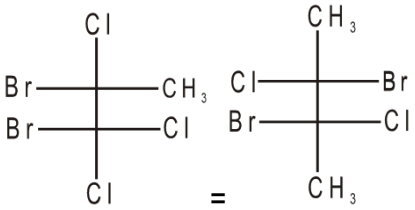
12.* Sol.

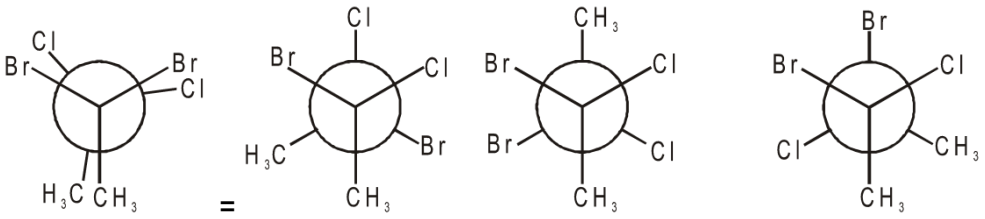




13. **Ans.** 3

Sol.

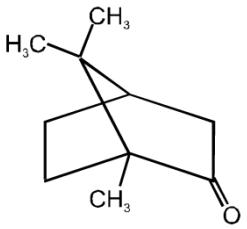




Three stable (staggered) conformers exist (with $\mu \neq 0$)

14. **Ans.** 2

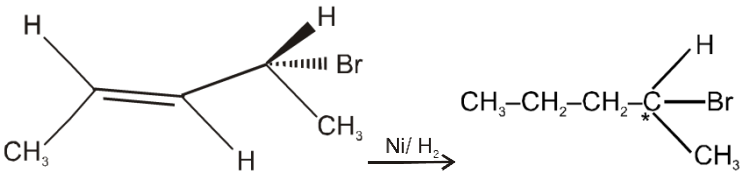
Sol. Total number of stereoisomers = 2



d + ℓ pair

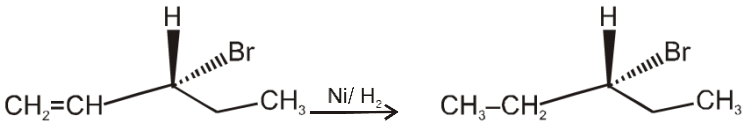
This molecule can not show geometrical isomerism so only mirror image will be other stereoisomer.

15. **Sol.** **(A)**



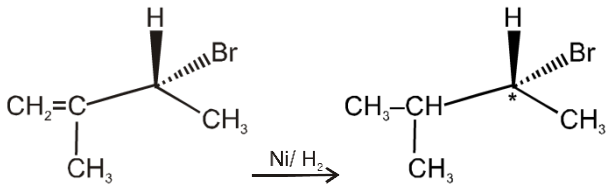
(Optically active)

(B)

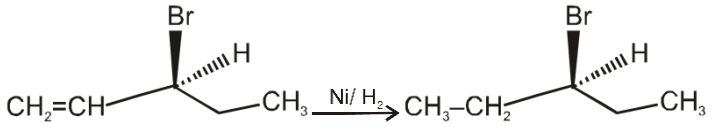


(Optically inactive)

(C)



(Optically active)

(D) 

(Optically inactive)

Additional Problems For Self Practice (APSP)

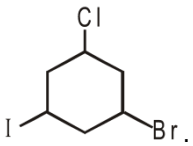
PART - I : PRACTICE TEST PAPER

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

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

Important Instructions

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

1. How many geometrical isomers are possible for 

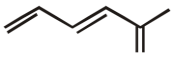
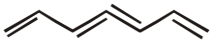
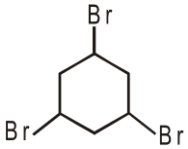
.

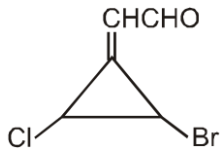
(1) 2 (2) 3 (3) 4 (4) 8

2. Which will not show geometrical isomerism ?

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

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

(1)  (2)  (3) 

(4) 

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

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

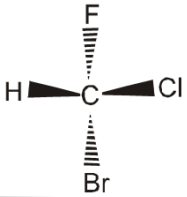
5. The total number of stereoisomers of 2,3-butanediol are

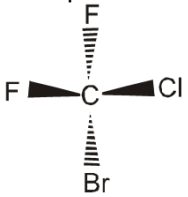
(1) four (2) two (3) six (4) three

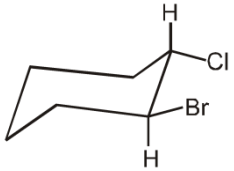
6. The most stable form of meso-tartaric acid is :

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

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

(1) 

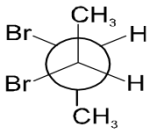
(2) 

(3) 

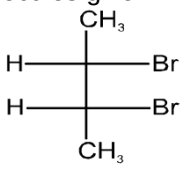
(4) More than one of these

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

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



II

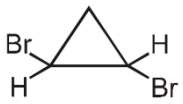


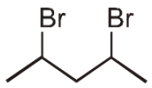
III

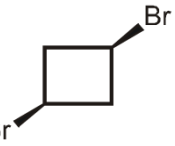
(1) Identical (2) Enantiomers (3) Diastereomers (4) Conformers

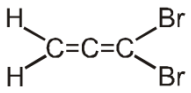
10. Which of the following compounds exhibits stereoisomerism ?
(1) 2-methylbutene-1 (2) 3-methylbutyne-1
(3) 3-methylbutanoic acid (4) 2-methylbutanoic acid

11. Identify the chiral species among the following :

(1) 

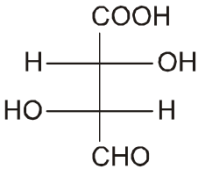
(2) 

(3) 

(4) 

12. The isomeric alcohol which has a chiral carbon atom is :
(1) n-butyl alcohol (2) iso-butyl alcohol (3) sec-butyl alcohol (4) tert-butyl alcohol

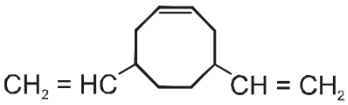
13. The configurations of the carbon atoms C_2 and C_3 in the following compound are respectively.



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

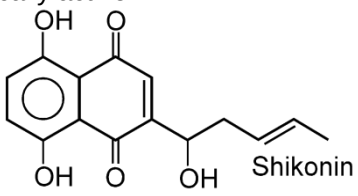
14. Which of the following will not show geometrical isomerism ?

(1) $CH_3–N=N–CH=CH_2$

(2) 

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

15. How many stereoisomers of shikonin (a drug for healing of wounds) are possible & how many of them are optically active ?



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

16. Molecular formula of smallest ester which contain one chiral carbon is :
(1) $C_4H_8O_2$ (2) $C_5H_{12}O$ (3) $C_6H_{12}O_2$ (4) $C_5H_{10}O_2$

17. The compound that has the highest dipole moment is
(1) cis-1,2-dichloroethene (2) trans-1,2-dichloroethene
(3) cis-1-bromo -2-chloroethene (4) trans-1-bromo-2-chloroethene.

18. The compound that will not be able to exhibit stereoisomerism is :
(1) 1,2-Dibromocyclopropane (2) Lactic acid
(3) 1-Bromopropene (4) Methylcyclopropane.

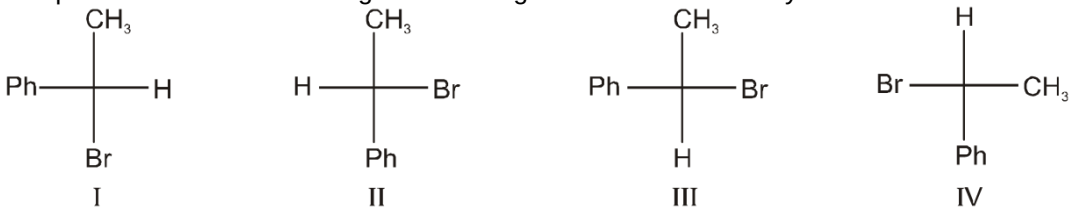
19. How many different alcohols (including optical isomers) are possible with the molecular formula $C_4H_{10}O$?
(1) 3 (2) 4 (3) 5 (4) 6

20. The achiral species among the following is :
(1) a car (2) a screw driver (3) a screw (4) a hand

21. Conformational changes in a molecule leads to change in
(1) torsional angle (2) bond angle (3) bond length (4) all of the above

22. Geometrical isomerism results because the molecule :
(1) rotates the plane of polarized light
(2) has a plane of symmetry
(3) has a centre of symmetry
(4) has two dissimilar groups attached to both ends of double bond.

23. The pair of enantiomers among the followings for 1-Bromo-1-Phenyl ethane are :



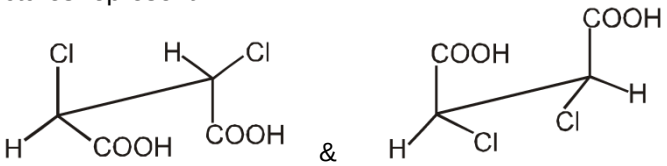
(1) I and IV (2) II and IV (3) II and III (4) I and II

24. The number of all types of isomers of chlorobutane is
(1) 2 (2) 4 (3) 6 (4) 5

25. The compound that is chiral
(1) 3-Methyl-3-hexene (2) 1-Chloro-4-methylcyclohexane
(3) 2-Phenylpentane (4) 1,3-Diisopropylbenzene

26. The number of stereoisomers of compound $CH_3–CH=CH–CH(Br)CH_3$ are :
(1) 2 (2) 3 (3) 4 (4) 6

27. The structures represent

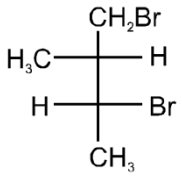


(1) geometrical isomers (2) positional isomers
(3) conformational isomers (4) configurational isomers

28. A compound is chiral even if
(1) a mirror plane is present (2) a centre of inversion exists
(3) a rotation axis exists (4) an improper rotation axis is present.

29. (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
(1) 0,2,4 (2) 2,2,4 (3) 0,3,3 (4) 0,2,3

30. The **R/S** designation for the following stereoisomer of 1,3-Dibromo-2-methylbutane is :



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

Practice Test (JEE-Main Pattern)

OBJECTIVE RESPONSE SHEET (ORS)

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

PART - II : PRACTICE QUESTIONS

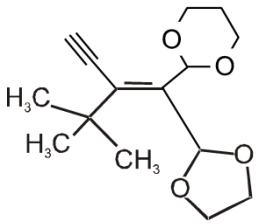
1. How many optically active stereoisomers are possible for Butane -2,3-diol ?
(1) 1 (2) 2 (3) 3 (4) 4.

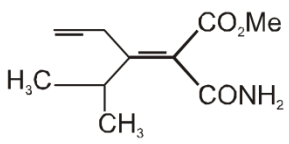
2. Which one of the following pair represents stereo isomerism :
(1) Linkage isomerism and Geometrical isomerism
(2) Chain isomerism and Rotational isomerism
(3) Optical isomerism and Geometrical isomerism
(4) Structural isomerism and Geometrical isomerism.

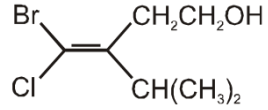
3. Which of the following is not chiral ?
(1) 2–Butanol (2) 2, 3–Dibromo pentane
(3) 3–Bromo pentane (4) 2–Hydroxy propanoic acid

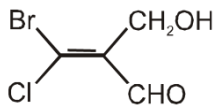
4. Among the following which one can have a meso form ?
(1) $CH_3CH(OH)CH(Cl)C_2H_5$ (2) $CH_3CH(OH)CH(OH)CH_3$
(3) $C_2H_5CH(OH)CH(OH)CH_3$ (4) $HOCH_2CH(Cl)CH_3$

5. Which one of the following compounds has (Z) configuration about the C–C double bond ?

(A) 

(B) 

(C) 

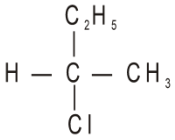
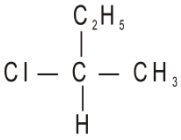
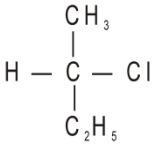
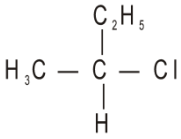
(D) 

6. The following symmetry element is present in the 'd' as will as the 'ℓ' form of Tartaric acid [$CO_2HCH(OH)CH(OH)CO_2H$]

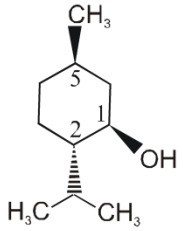
(1) centre of symmetry (2) axis of symmetry (C_2)

(3) plane of symmetry (4) None

7. $CH_3 - CHCl - CH_2 - CH_3$ has a chiral centre which one of the following represents its R configuration :

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

8. The absolute configurations of the chiral centres 1, 2 and 5 in the following molecule are

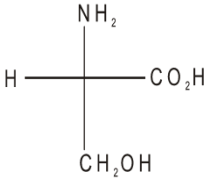
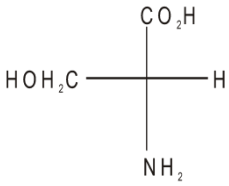
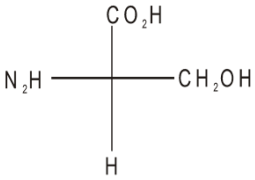
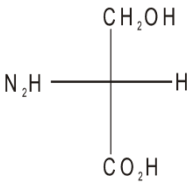


(1) 1R, 2R, 5R (2) 1S, 2S, 5S (3) 1R, 2S, 5R (4) 1S, 2R, 5S

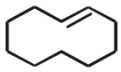
9. Which of the following acids does not exhibit optical isomerism ?

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

10. Among the following L–serine is :

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

11. Which will not show geometrical isomerism ?

(1) $CH_3CH = NOH$ (2)  (3) $HO - N = N - OH$ (4) $(CH_3)_2C = NOH$

12. The compound CHCl = CHCHOHCOOH with molecular formula $C_4H_5O_3Cl$ can exhibit

(1) geometric, optical, position and functional isomerism.

(2) geometric. optical and functional isomerism only

(3) position and functional isomerism only

(4) geometric and optical isomerism only

13. Increasing order of stability among the three main conformations of 2-Fluoroethanol is :

(1) Eclipse, Gauche, Anti (2) Gauche, Eclipse, Anti

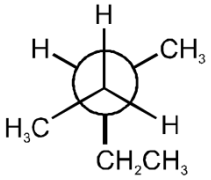
(3) Eclipse, Anti, Gauche (4) Anti, Gauche, Eclipse

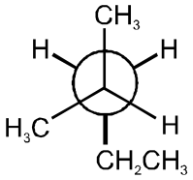
14. Among the isomers of Dimethylcyclohexanes, the chiral ones are

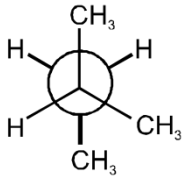
(1) 1, 2-trans and1, 3-cis (2) 1, 2-cis and 1,3-trans

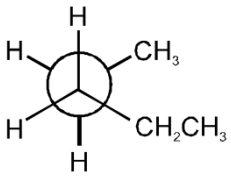
(3) 1, 3-trans and 1, 4-trans (4) 1, 2-trans and 1,3-trans

15. The correct conformational structure of 2-methylpentane is :

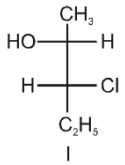

(1)

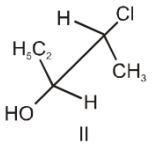

(2)

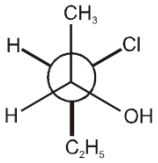

(3)

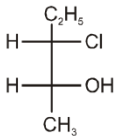

(4)

16. The two projection formulae that represent a pair of enantiomers are.


I

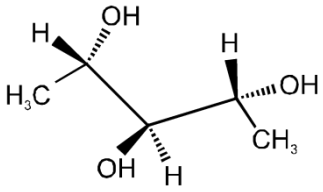

II

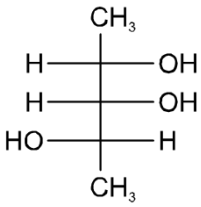

III

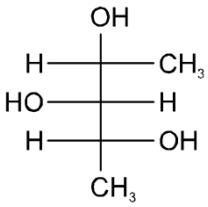

IV

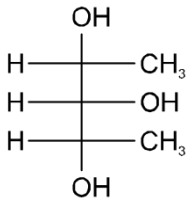
(1) I and II (2) III and IV (3) I and III (4) II and IV

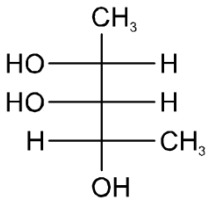
17. The Fischer projection formula that represents the following compounds is




(1)


(2)


(3)


(4)

18. Complete catalytic hydrogenation of naphthalene gives decalin ($C_{10}H_{18}$). The number of isomers of decalin formed and the total number of isomers of decalin possible are respectively.

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

APSP Answers

PART - I

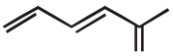
1.	(3)	**2.**	(4)	**3.**	(4)	**4.**	(2)	**5.**	(4)
6.	(2)	**7.**	(2)	**8.**	(2)	**9.**	(3)	**10.**	(4)
11.	(1)	**12.**	(3)	**13.**	(1)	**14.**	(4)	**15.**	(2)
16.	(4)	**17.**	(1)	**18.**	(4)	**19.**	(2)	**20.**	(2)
21.	(1)	**22.**	(4)	**23.**	(3)	**24.**	(4)	**25.**	(3)
26.	(3)	**27.**	(4)	**28.**	(3)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

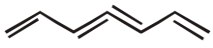
PART - II

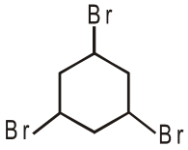
1.	(2)	**2.**	(3)	**3.**	(3)	**4.**	(2)	**5.**	(2)
6.	(2)	**7.**	(2)	**8.**	(3)	**9.**	(1)	**10.**	(1)
11.	(4)	**12.**	(1)	**13.**	(3)	**14.**	(4)	**15.**	(2)
16.	(3)	**17.**	(4)	**18.**	(1)				

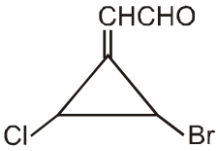
APSP Solutions

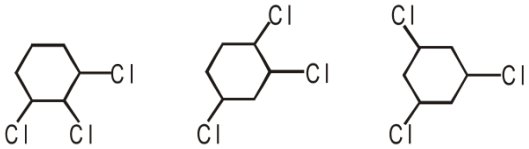
PART - I

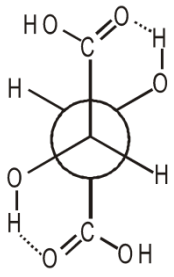
3.  Geometrical isomers = 2

 Geometrical isomers = 0

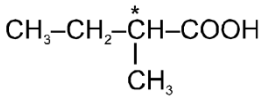
 Geometrical isomers = 2

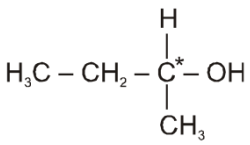
 Geometrical isomers = 4

4. 

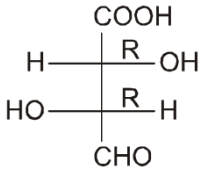
6.  (Anti form)

9. Compounds are diastereomers.

10. 

12. 

13.



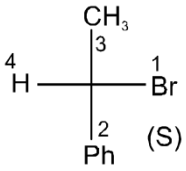
Based on RS convention the given compound has RR configuration.

14. Follow conditions of geometrical isomerism.

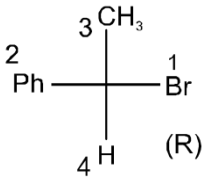
15. There are two stereocentres in the compound, so total stereoisomers = $2^2 = 4$. All 4 will be optically active.

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

23.

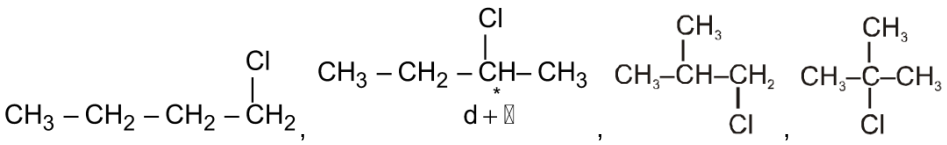


II



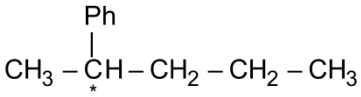
III

24. Chlrorobutane :



Overall 5 isomers

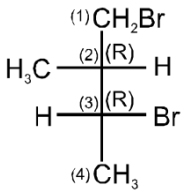
25. Only (3) has asymmetric carbon atom.



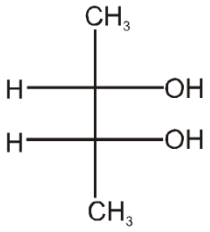
26. CH_3–CH=CH–CH(Br)CH_3 has 4 stereo isomers, with (Z, R), (Z, S), (E, R) and (E, S) configuration.

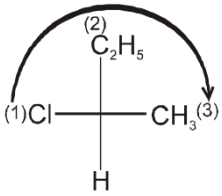
29. Geometrical isomer for (i) = 0, (ii) = 2, (iii) = 3.

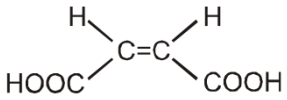
30. The given structure has 2R, 3R designation.



3. 3–Bromopentane does not have chiral carbon.

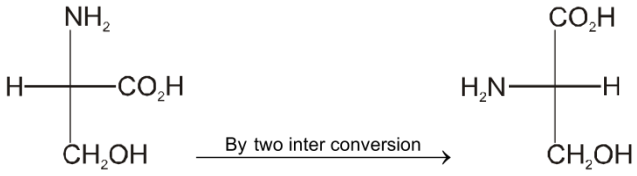
4.  meso form

7.  clockwise arrow represent 'R' configuration.

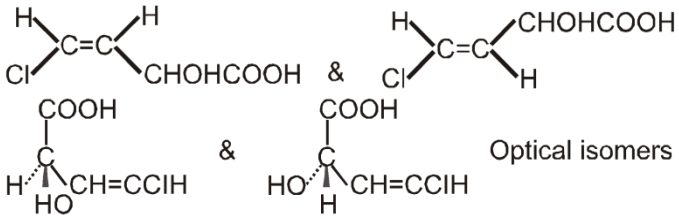
9. 

Maleic acid

It shows Geometrical isomerism but does not show optical isomerism.

10.  NH_2 group at LHS. So configuration is 'L'

11. Since in ketoxime $(CH_3)_2C = NOH$ two same ($-CH_3$) groups are present on double bonded carbon atom, its other form is not possible and it does not exhibit geometrical isomerism.

12.  Geometrical isomers

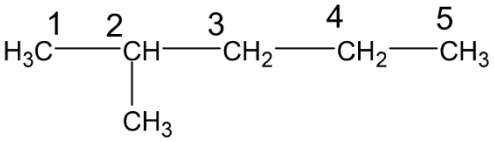
 Optical isomers

CHCl = CHCHOHCOOH & CH_2=C(Cl)CH(OH)COOH Position isomers

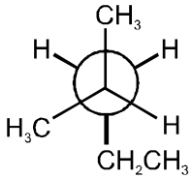
CHCl = CHCHOHCOOH & O=CH–CH(Cl)$COOCH_3$ Functional isomers

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

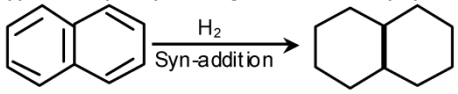
15. The correct conformer is



Rotation of bond around C-3 & C-4, we get the below structure.



16. (I) have (R,R) configuration and (III) have (S,S) configuration.

18. 

Cis-decalin