Exercise-1

Marked Questions may have for Revision Questions.

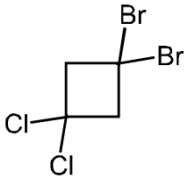
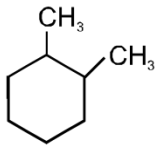
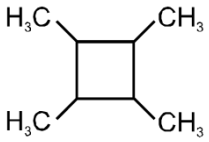
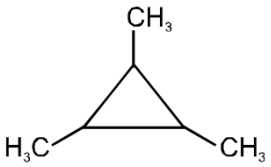
OBJECTIVE QUESTIONS

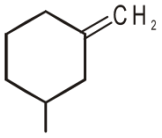
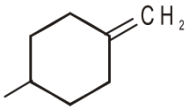
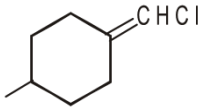
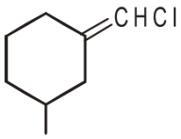
Section (A) : Geometrical isomerism

A-1. Stereoisomers have different :
(1) Molecular formula (2) Structural formula (3) Configuration (4) Molecular mass

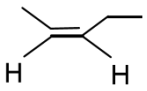
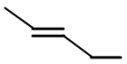
A-2. Which can show the cis-trans isomerism :
(1) $ClCH_2CH_2Cl$ (2) $Cl_2C=CH_2$ (3) $Cl_2C=CCl_2$ (4) ClCH=CHCl

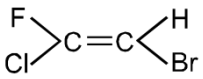
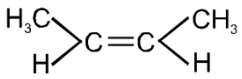
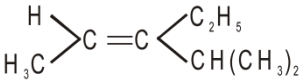
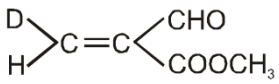
A-3. Which of the following compounds will not show geometrical isomerism :
(1) Azomethane (2) 1-Bromo-2-chloroethene
(3) 1-Phenylpropene (4) 2-Methyl-2-butene

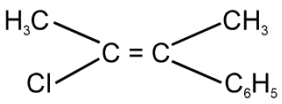
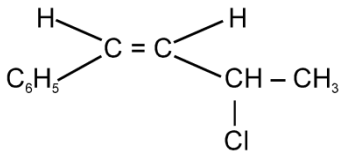
A-4. Which of the following compound can not show geometrical isomerism ?
(1) 
(2) 
(3) 
(4) 

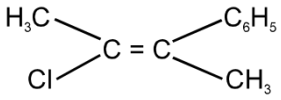
A-5. The geometrical isomerism is shown by :-
(1) 
(2) 
(3) 
(4) 

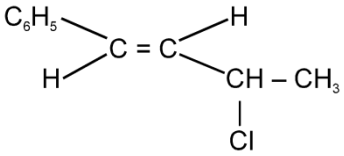
Section (B) : CIP Rules (E/Z Naming) & Physical Properties of G.I

B-1. Identify (Z) - 2 - pentene :
(1) 
(2) 
(3) 
(4) 

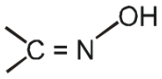
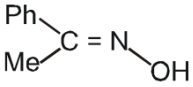
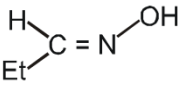
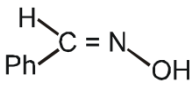
B-2. The 'E'-isomer is/are :
(1) 
(2) 
(3) 
(4) 

B-3. The correct stereochemical formula of Trans-3-chloro-1-phenylbut-1-ene is
(1) 
(2) 

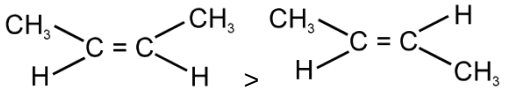
(3) 

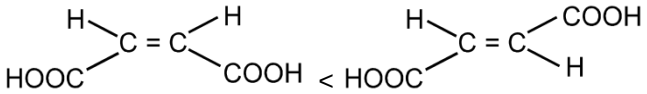
(4) 

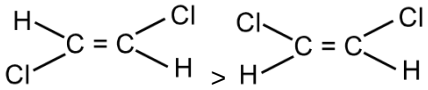
B-4. Which of the following is a syn isomer :-

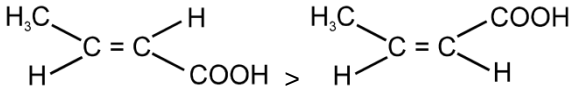
(1)  (2)  (3)  (4) 

B-5. The correct order/s for the given pair of isomers is

(1)  (Melting point)

(2)  (Dipole moment)

(3)  (Boiling point)

(4)  (Water solubility)

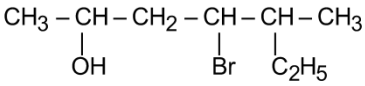
Section (C) : Chiral carbon and Projection Formula

C-1. Chiral molecules are :

(1) Superimposable on their mirror image (2) Not superimposable on their mirror image

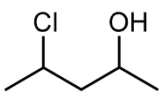
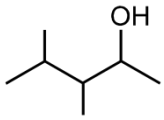
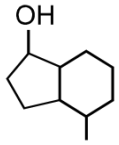
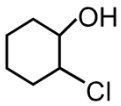
(3) unstable molecules (4) capable of showing geometrical isomerism

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



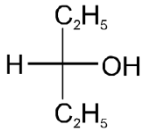
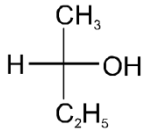
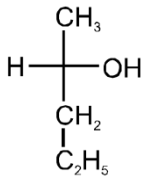
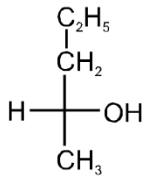
(1) 2 (2) 3 (3) 4 (4) 5

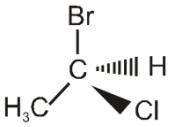
C-3. The compound which has maximum number of chiral centres is

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

Section (D) : Configurational nomenclature in optical isomers

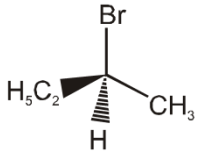
D-1. Which of the following is the structure of (S)-Pentan-2-ol is ?

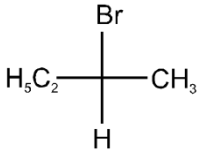
(1)  (2)  (3)  (4) 

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

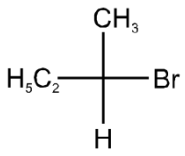
(1) E (2) R (3) S (4) Z

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

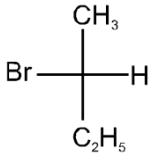




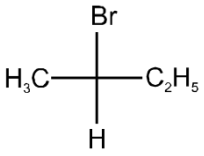
(1)



(2)

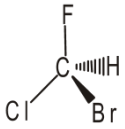


(3)

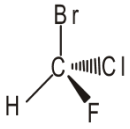


(4)

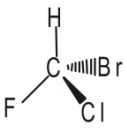
D-4. Which of the following have same configuration.



I



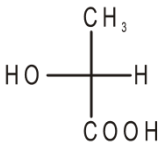
II



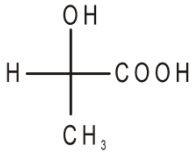
III

(1) I & II (2) II & III (3) I & III (4) All

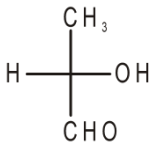
D-5. Which has D configuration.



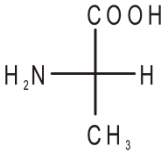
(1)



(2)

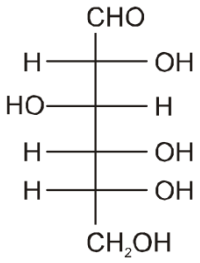


(3)

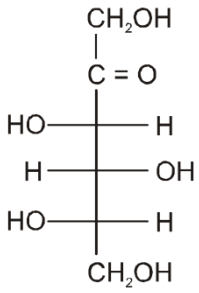


(4)

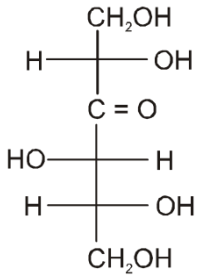
D-6. D-Fructose ($C_6H_{12}O_6$) has IUPAC name (3L, 4D, 5D) 1, 3, 4, 5, 6-Pentahydroxyhexan-2-one. Its last asymmetric carbon atom (C^*_5) has D-configuration. The correct stereochemical formula of D-Fructose is :



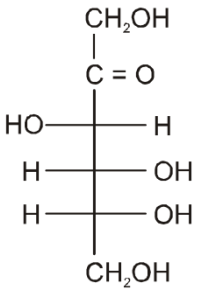
(1)



(2)



(3)



(4)

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

E-1. Which statement is wrong about symmetry ?

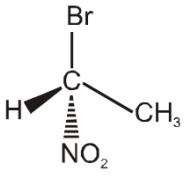
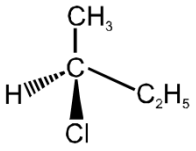
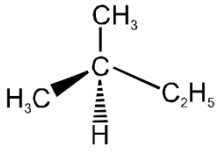
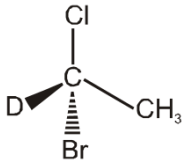
(1) Plane of symmetry is an imaginary plane which bisects the molecule in two equal halves in such a way that each half of the molecule is the mirror image of the other half.

(2) Centre of symmetry is the point in a molecule through which if the straight line is drawn from any part of the molecule and if then this line encounters identical groups at equal distances in opposite direction.

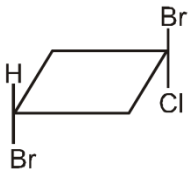
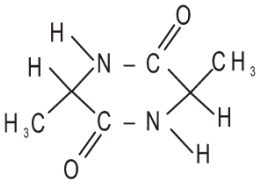
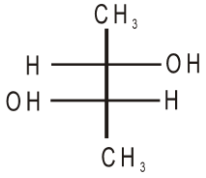
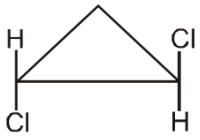
(3) A molecule which does not possess any element of symmetry is called asymmetric molecule.

(4) A molecule which does not possess any element of symmetry is called symmetric molecule.

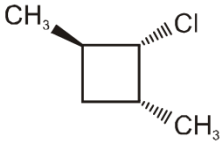
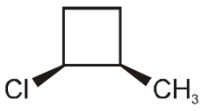
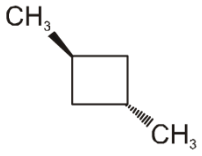
E-2. Which of the following compound posses plane of symmetry ?

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

E-3. Which of the following compound posses centre of symmetry ?

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

E-4. Which of the following are chiral :

(a) 
(b) 
(c) 
(d) 

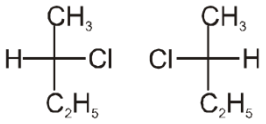
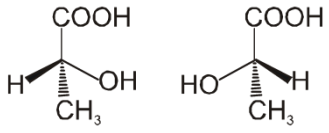
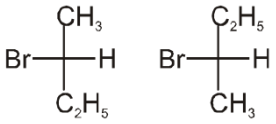
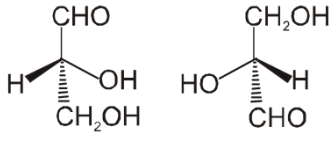
(1) a, b, c (2) a, b, d (3) b, c, d (4) a, c, d

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

F-1. Which of the following statements is not correct :

(1) Enantiomers are essentially chiral and optically active.
(2) Diastereomers are not neccesarily chiral and optically active.
(3) All geometrical isomers are diastereomers.
(4) All diastereomers are chiral and optically active.

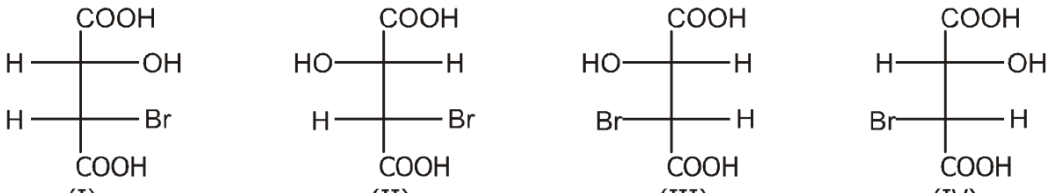
F-2. Which is not the pair of enantiomers ?

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

F-3. Stereoisomers which are not mirror image of each other, are called :

(1) Enantiomers (2) Tautomers (3) Meso (4) Diastereomers

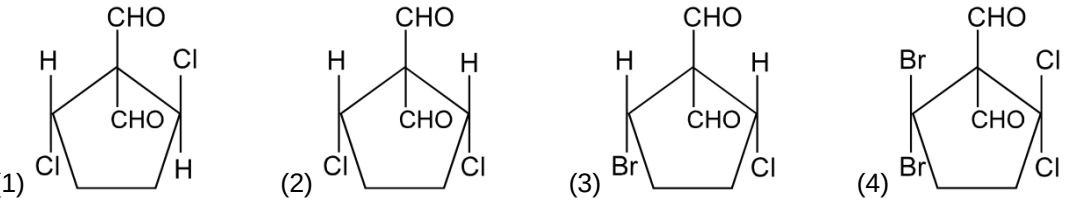
F-4. Which one among the following is not diastereomeric pair.



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

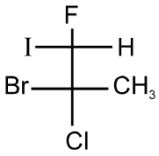
(1) I and III (2) I and II (3) II and III (4) I and IV

F-5. Which of the following is a meso isomer ?



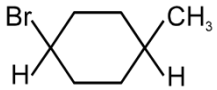
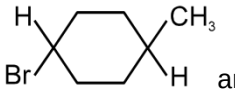
(1) (2) (3) (4)

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



(I)

(1) Enantiomer (2) Diastereomers (3) Constitutional isomer (4) Identical molecules

F-7.  and  are

(1) Enantiomers (2) Optical inactive diastereomers

(3) Optical active diastereomers (4) Identical

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

G-1. The instrument which can be used to measure optical activity, i.e., specific rotation:

(1) Refractometer (2) Photometer (3) Voltmeter (4) Polarimeter

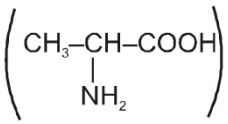
G-2. (+) tartaric acid has a specific rotation of + 12 unit when measured in 12 cm polarimeter tube and 2g/ml concentration at given temperature and light. When it is diluted to half the concentration, length of tube and other parameters being same, then the specific rotation will be :

(1) + 6 unit (2) + 12 unit (3) – 6 unit (4) + 24 unit

G-3. 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).

(1) 80%, + 2.7 unit (2) 20%, – 27 unit (3) 20%, + 2.7 unit (4) 80%, – 27unit

Section (H) : Racemic mixture, Optical Resolution

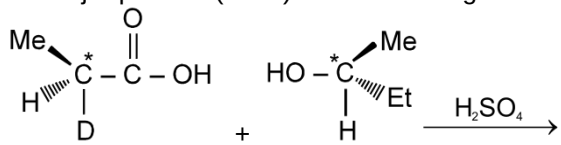
H-1. The racemic mixture of Alanine  can be resolved by using,

(a) (+)-2-Butanol (b) (ℓ)-2-Chlorobutanoic acid

(c) (±) -2-Butanol (d) (dℓ mix)-2-Chlorobutanoic acid

(1) a & b only (2) a & c only (3) b & d only (4) c & d only

H-2. The major product (ester) of the following reaction is



(1) A single stereoisomer (optically active)

(2) A mixture of diastereomers (both optically active)

(3) A racemic mixture (optically inactive)
(4) A mixture of four stereoisomers (two racemic mixtures)

H-3. Which of the following pair of isomers can not be separated by fractional crystallisation or fractional distillation:
(1) Maleic acid and Fumaric acid (2) (+)-Tartaric acid and meso-tartaric acid
(3) $CH_3-\underset{\displaystyle NH_2}{\underset{|}{CH}}-COOH$ and $H_2N–CH_2–CH_2–COOH$ (4) (+)-lactic acid and (–)-lactic acid

Section (I) : Conformations, strains and stability

I-1. Which statement is **false** :
(1) When value of dihedral angle is 180º then this conformation is called anti conformation.
(2) When $\phi = 60^\circ$ then this conformation is called gauche.
(3) When $\phi = 0^\circ$ then this conformation is called eclipsed conformation.
(4) Other than staggered and eclipsed conformation are called gauche conformations.

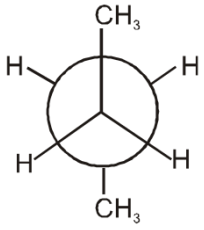
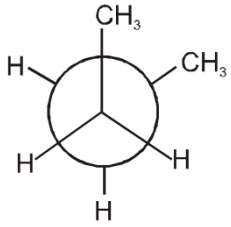
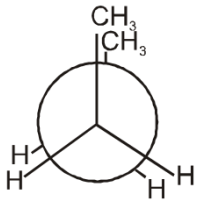
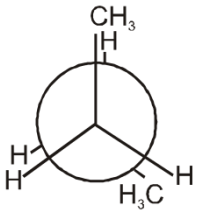
I-2. The eclipsed and staggered conformation of ethane is due to –
(1) Free rotation about C–C single bond (2) Restricted rotation about C–C single bond
(3) Absence of rotation about C–C bond (4) None of the above

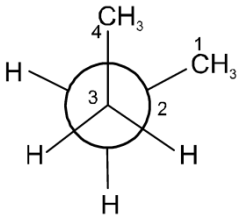
I-3. Which of the following is associated with Torsional strain ?
(1) Repulsion between bond pair of electrons (2) Size of the groups present at adjacent atoms
(3) Bond angle strain (4) Attraction of opposite charges

I-4. The Baeyer's angle strain is expected to be maximum in
(1) Cyclodecane (2) Cyclopentane (3) Cyclobutane (4) Cyclopropane

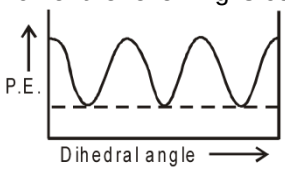
I-5. The minimum torsional strain developed in butane is at dihedral angle(s)
(1) 0º, 108º (2) 120°, 240º (3) 60°, 180°, 300° (4) 60°, 120°, 180°

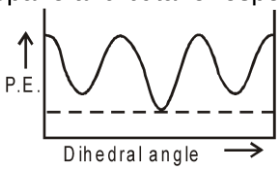
Section (J) : Conformational analysis of Ethane, Propane, Butane and Substituted butane

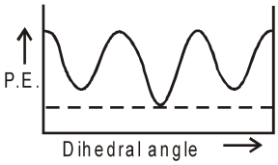
J-1. In the following the most stable conformation of *n*-butane is :
(1) 
(2) 
(3) 
(4) 

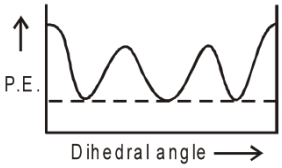
J-2. Newman projection of Butane is given,C-2 is rotated by 120º along C_2-C_3 bond in anticlockwise direction the conformation formed is :

(1) anti (2) fully eclipsed (3) gauche (4) partially eclipsed

J-3. Which of the following is correct P.E. diagram for propane and butane respectively ?

(I) 

(II) 

(III) 

(IV) 

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

J-4. The dipole moment of 1, 2-Dichloroethane is 1.12 D. Which statement is correct about this compound.

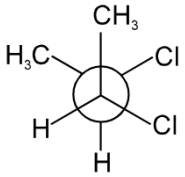
(1) It exists mainly in fully eclipsed conformation.

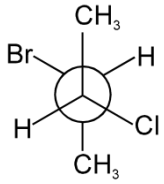
(2) It exists only in anti conformation.

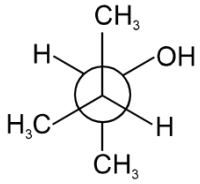
(3) The polarity is due to gauche (skew) conformation.

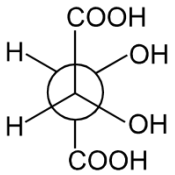
(4) The anti conformation has highest dipole moment.

J-5. Which of the following is an achiral molecule?

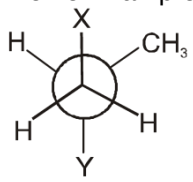
(1) 

(2) 

(3) 

(4) 

J-6. The newman projection formula of 2,3-dimethylbutane is given as



X, Y respectively can be :

(1) $-CH(CH_3)_2$ and H (2) $-CH_3$ and $-C_2H_5$ (3) $-C_2H_5$ and $-CH_3$ (4) H and $-CH(CH_3)_2$

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

K-1. In 2-Fluoroethanol which conformer will be most stable ?

(1) Eclipsed (2) Skew (3) Gauche (4) Staggered

K-2. Which of the following statement regarding the populations of different conformations of optically active butane-2, 3- diol is true

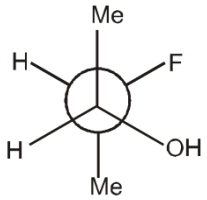
(1) The most populated conformer will have the hydroxy group at anti-position.

(2) All staggered conformations will be equally populated and are major.

(3) The most populated conformer will have hydroxyl groups at guache position.

(4) Relative populations of different conformers are not predictable.

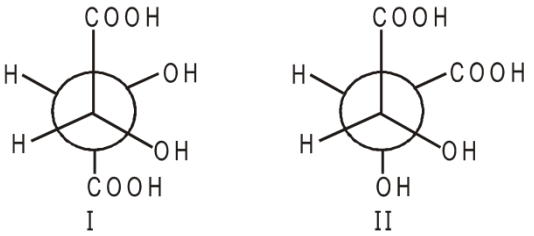
K-3. The true statement about the following corformation is :



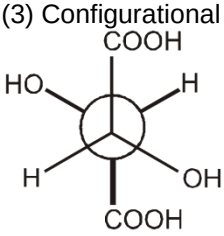
(1) It has maximum angle strain.

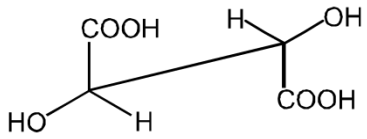
(2) It does not have eclipsing strain (tortional strain).
(3) It does not have any intramolecular hydrogen bonding.
(4) It has maximum vander waal strain.

K-4. The structures I and II are



(1) Conformational diastereomers (2) Configurational enantiomers
(3) Configurational diastereomers (4) Identical

K-5. 

and 

are

(1) Enantiomers (2) diastereomers (3) Identical compounds (4) Conformers

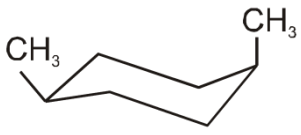
Section (L) : Conformational analysis of cyclohexane

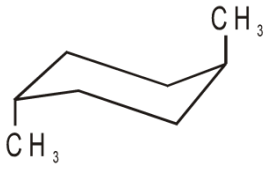
L-1. The least stable conformation of cyclohexane is
(1) Boat (2) Chair (3) Twist boat (4) Half chair

L-2. Flagpole interaction is present in :
(1) Boat form of cyclohexane (2) Chair form of cyclohexane
(3) Anti form of n-butane (4) Fully eclipsed form of n-butane

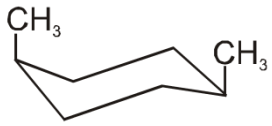
L-3. Chair form of cyclohexane is more stable than boat form because :
(1) In chair form carbons are in staggered form and in boat form carbons are in eclipsed form
(2) In chair form carbons are in eclipsed form and in boat form all the carbons are in staggered form
(3) Bond angle in chair form is 111° and bond angle in boat form is 109.5°
(4) Bond angle in chair form is 109.5° and in boat form 111°

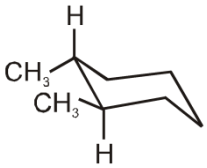
L-4. The most stable form of trans-1,4-dimethylcyclohexane is represented as :

(1) 

(2) 

(3) 

(4) 

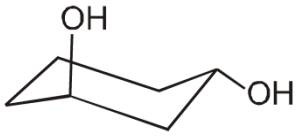


L-5. Geometry of the given compound is:
(1) Cis (2) Trans

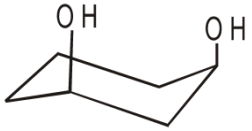
(3) Cis and trans both (4) No geometrical isomerism

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

(1) 

(2) 

(3) 

(4) 

Section (M) : Calculation of stereoisomers

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

Ph – CH = CH – CH = CH – COOH

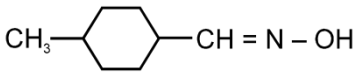
(1) 3 (2) 4 (3) 2 (4) 1

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

$CH_3 – CH = CH – CH = CH – CH = CH_2$

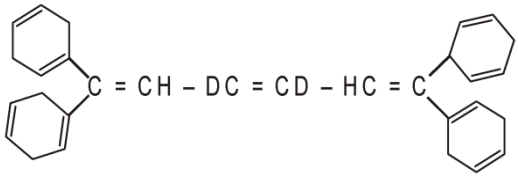
(1) 2 (2) 4 (3) 6 (4) 8

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



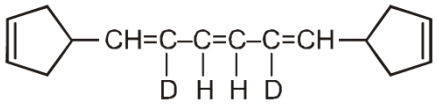
(1) 2 (2) 4 (3) 6 (4) 8

M-4. Total number of geometrical isomers in the given compound is :



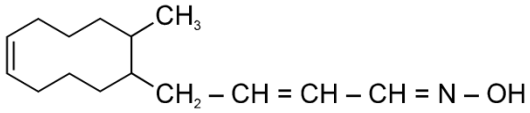
(1) 2 (2) 4 (3) 6 (4) 8

M-5. Total number of geometrical isomers in the given compound is :



(1) 3 (2) 6 (3) 8 (4) 16

M-6. No. of Geometrical isomers for following compound is :

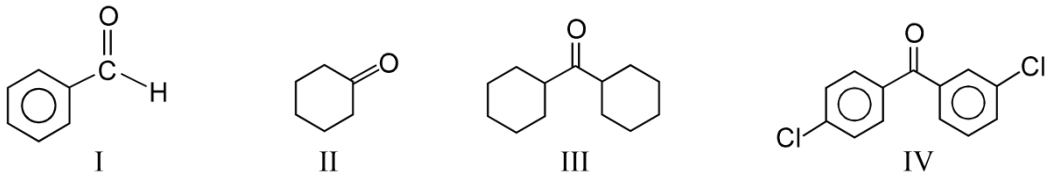


(1) 8 (2) 16 (3) 32 (4) 10

M-7. Which carbonyl compounds can give one oxime only on reaction with hydroxyl amine ?

(1) HCHO (2) CH_3CHO (3) PhCHO (4) CH_3COPh

M-8. Which of the following will form only one oxime on reaction with NH_2OH solution ?

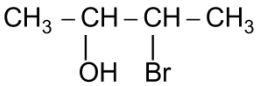


I II III IV

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

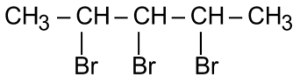
M-9. Select the correct options for molecular formula $C_2H_2Cl_2$:
(1) The total number of isomers is 4. (2) All the structures show geometrical isomerism.
(3) All isomers have 5σ bonds and one π bond. (4) Its has linear shape.

M-10. Total number of stereoisomers of compound is :



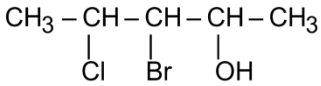
(1) 2 (2) 4 (3) 6 (4) 8

M-11.



Total number of stereoisomers in above compound is :
(1) 6 (2) 4 (3) 8 (4) 16

M-12.



Total number of stereoisomers in above compound is :
(1) 6 (2) 4 (3) 8 (4) 16

M-13. How many meso steroisomers are possible for 2, 3, 4–pentanetriol :
(1) 1 (2) 2 (3) 3 (4) None

M-14. The total number of isomers for C_4H_8 is
(1) 5 (2) 6 (3) 7 (4) 8

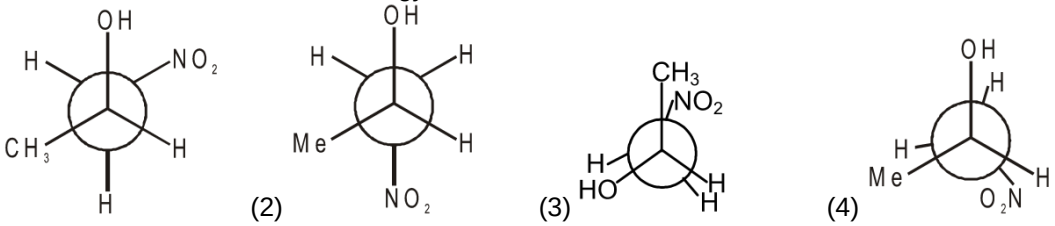
Exercise-2

Marked Questions may have for Revision Questions.

PART - I : OBJECTIVE QUESTIONS

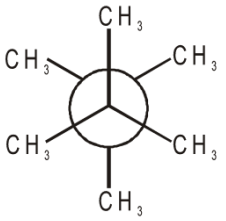
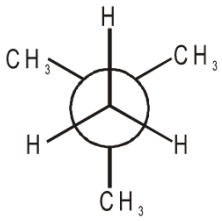
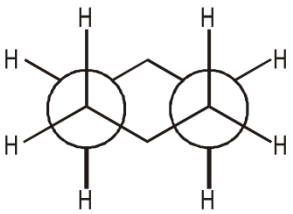
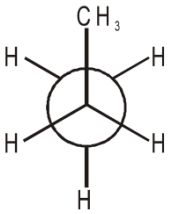
1. Number of conformational isomers of ethane is :
(1) 7 (2) 3 (3) 4 (4) Infinite

2. Which conformer has maximum energy ?

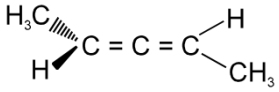
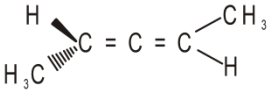


(1) (2) (3) (4)

3. In which conformation torsional energy (rotational barrier) is minimum.


(1)

(2)

(3)

(4)

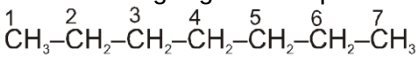
4. The following molecules are :

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

5. A recemic mixture contains dextrorotatory and laevorotatory isomers in the proportion –
(1) 2 : 1 (2) 1 : 1 (3) 1 : 5 (4) 3 : 1

6. Consider the following organic compound :



To make it a chiral compound, the attack should be on carbon atom no.
(1) 1 (2) 3 (3) 4 (4) 7

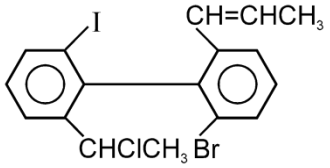
7. The number of isomers for the compound with molecular formula $C_2BrClFI$ are :
(1) 2 (2) 6 (3) 4 (4) 3

8. How many n-octene can show geometrical isomerism ?
(1) 2 (2) 6 (3) 4 (4) 3

9. How many oximes are formed when 3-Phenylprop-2-enal reacts with NH_2OH
(1) 2 (2) 6 (3) 4 (4) 3

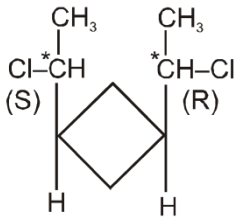
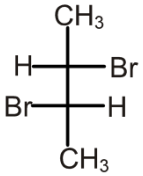
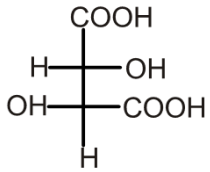
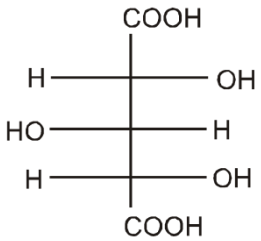
10. All carbonyl compounds with molecular formula C_3H_6O when react with excess of NH_2OH, How many total isomeric oximes are formed ?
(1) 2 (2) 1 (3) 4 (4) 3

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



(1) 2 (2) 6 (3) 4 (4) 8

12. Which of the following molecule is chiral :

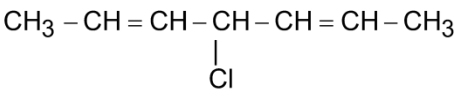

(1)

(2)

(3)

(4)

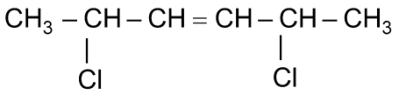
13. Total number of optically active stereoisomers of tartaric acid are
(1) 2 (2) 1 (3) 4 (4) 3

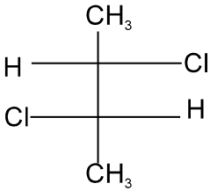
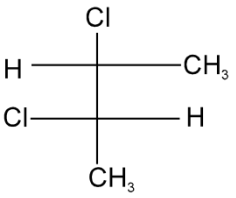
14. The total number of ketones (including stereo isomers) with the molecular formula $C_6H_{12}O$ is :
(1) 3 (2) 7 (3) 4 (4) 8

15. The sum of total stereoisomers and fractions on the fractional distillation of 2, 3- Dichloropentane is.
(1) 2 (2) 6 (3) 4 (4) 3

16. Total D stereoisomers (open chain only) for the given structure will be :
$CH_2(OH)CH(OH)CH(OH)CH(OH)CHO$
(1) 2 (2) 6 (3) 4 (4) 3

17. Total number of stereoisomers of compound  are :
(1) 2 (2) 6 (3) 4 (4) 3

18. Total number of optically active stereoisomers of  are :
(1) 2 (2) 6 (3) 4 (4) 3

19. If optical rotation produced by  is + 36º then that produced by  is
(1) –36º (2) 0º (3) +36º (4) unpredictable

20. Total number of optical active stereoisomers of the following compound are :
$CH_3–CH=CH–CHCl–CH=C=CH–CH=CH–CH_3$
(1) 8 (2) 16 (3) 32 (4) 12

PART - II : MISCELLANEOUS QUESTIONS

Section (A) : ASSERTION/REASONING

DIRECTIONS : Each question has 4 choices (1), (2), (3) and (4) out of which ONLY ONE is correct.

(1) Both assertion and reason are correct, and the reason is the correct explanation for the assertion
(2) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion
(3) The assertion is incorrect, but the reason is correct
(4) Both are assertion and reason are incorrect

A-1. **Assertion :** lactic acid shows gemetrical isomerism.
Reason : Because it does not have chiral carbon.

A-2. **Assertion :** Meso tartaric acid is optically inactive
Reason : Because it has plane of symmetry.

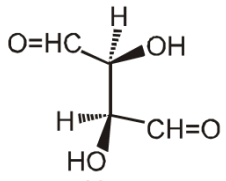
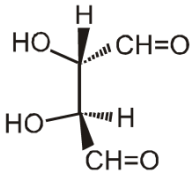
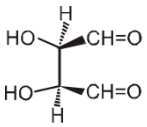
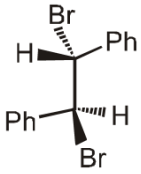
A-3. **Assertion :** All the hydrogen atoms in but-2-ene lie in one plane.
Reason : Because all carbon atom are sp^2 hybridized in it.

A-4. **Assertion :** Boiling points of cis-isomers are higher than trans-isomers generally.
Reason : Dipole moments of cis-isomers are higher than trans-isomers.

Section (B) : MATCH THE COLUMN

Note : Only one answer type (1 × 1)

B-1. Match the column-I with column-II

Column-I	Column-II
(A) 	(p) Chiral Molecule
(B) 	(q) Can show geometrical isomerism
(C) 	(r) Centre of symmetry present
(D) 	(s) Plane of symmetry present

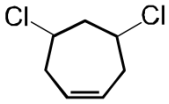
Section (C) : ONE OR MORE THAN ONE OPTIONS CORRECT

C-1. Which is/are correct statements about geometrical isomers.

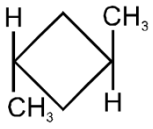
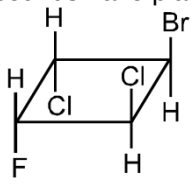
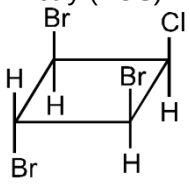
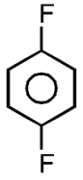
(1) Geometrical isomers can be separated by fractional distillation.

(2) In two geometrical isomers the distance between two particular groups at the ends of the restricted bond must be changed.

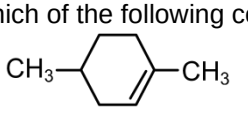
(3) In cycloalkenes, geometrical isomerism exist across C=C with ring size equal to or greater than 8 carbon atom.

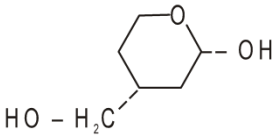
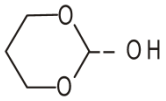
(4)  doesn't show geometrical isomerism because it has only 7 C atoms in ring.

C-2. Which of the following compounds have plane of symmetry (POS) ?

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

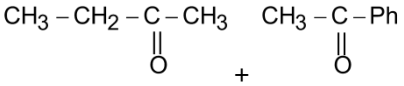
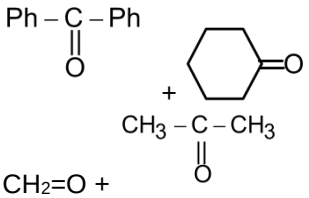
C-3. Which of the following compounds will show enantiomerism ?

(1)  (2) 

(3)  (4) 

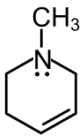
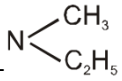
C-4. The compounds X and Y in below reaction can be (when total two organic products are formed) :

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

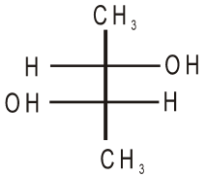
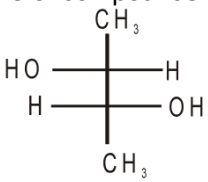
(1)  (2) 

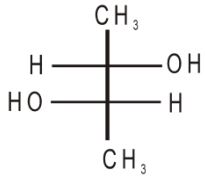
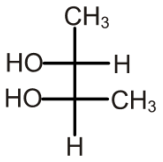
(3) $CH_2=O + CH_3CHO$ (4) $CH_2=O +$

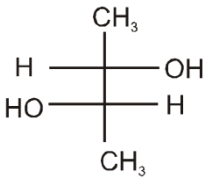
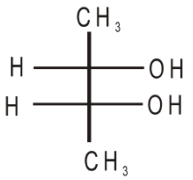
C-5. Which of the following amines is/are optically active ?

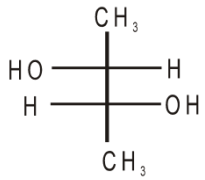
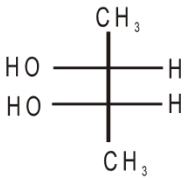
(1)  (2) $CH_3NHC_2H_5$ (3) $CH_3CH_2CH_2-$  (4) sec-Butylamine

C-6. Which of the following pairs of compounds are enantiomers :

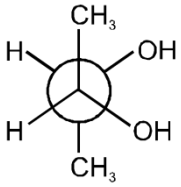
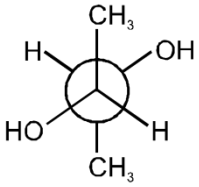
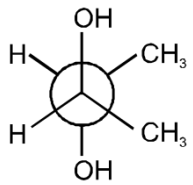
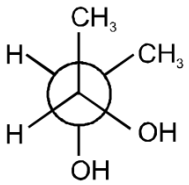
(1)  and 

(2)  and 

(3)  and 

(4)  and 

C-7. The optically inactive isomer of butan-2,3-diol is/are :

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

Exercise-3

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

OFFLINE JEE-MAIN

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

(1) Isomeric compounds (2) Chiral compounds

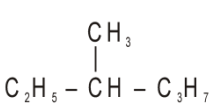
(3) Meso compounds (4) Optical isomers

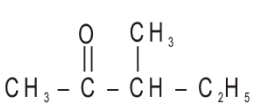
2. Which of the following does not show geometrical isomerism ? **[AIEEE 2002, 3/225]**

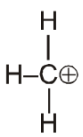
(1) 1,2-Dichloro-1-pentene (2) 1,3-Dichloro-2-pentene

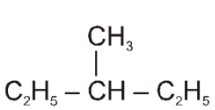
(3) 1,1-Dichloro-1-pentene (4) 1,4-Dichloro-2-pentene

3. Among the following four structures I to IV. **[AIEEE 2003, 3/225]**

 (I)

 (II)

 (III)

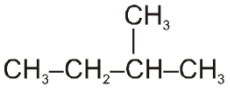
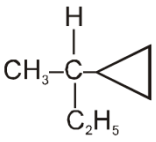
 (IV)

it is true that

(1) All four are chiral compounds (2) Only I and II are chiral compounds

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

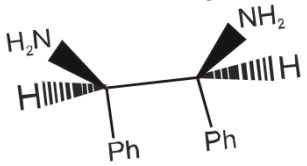
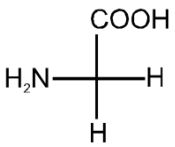
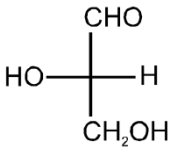
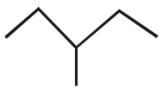
4. Which of the following will have a meso-isomer also ? **[AIEEE 2004, 3/225]**
(1) 2-Chlorobutane (2) 2,3-Dichlorobutane (3) 2,3-Dichloropentane (4) 2-Hydroxypropanoic acid

5. Amongst the following compounds, the optically acitve alkane having lowest molecular mass is **[AIEEE 2004, 3/225]**
(1) $CH_3–CH_2–CH_2–CH_3$ (2)  (3)  (4) $CH_3–CH_2–C\equiv CH$

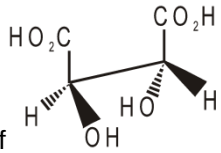
6. Which of the following compounds is not chiral ? **[AIEEE 2004, 3/225]**
(1) 1–Chloropentane (2) 2-Chloropentane
(3) 1-Chloro-2-methylpentane (4) 3-Chloro-2-methylpentane

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

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

9. Which of the following molecules is expected to rotate the plane of polarized light? **[AIEEE 2007, 3/120]**
(1)  (2)  (3)  (4) 

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

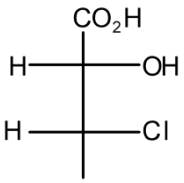
11. The absolute configuration of  is **[AIEEE 2008, 3/105]**
(1) R, R (2) R, S (3) S, R (4) S, S

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

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

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

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



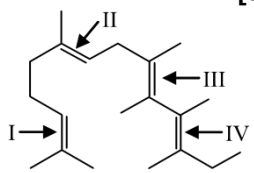
16. The absolute configuration of is **[JEE(Main) 2016, 4/120]**
(1) (2S, 3R) (2) (2S, 3S) (3) (2R, 3R) (4) (2R, 3S)

ONLINE JEE-MAIN

1. Which one of the following acids does not exhibit optical isomerism?
[JEE(Main) 2014 Online (12-04-14), 4/120]
(1) Lactic acid (2) Tartaric acid (3) Maleic acid (4) α-amino acid

2. The optically inactive compound from the following is :
[JEE(Main) 2015 Online (10-04-15), 4/120]
(1) 2-chloropentane (2) 2-chloropropanal
(3) 2-chloro-2-methylbutane (4) 2-chlorobutane

3. In the following structure, the double bonds are marked as I, II, III and IV
[JEE(Main) 2017 Online (09-04-17), 4/120]



Geometrical isomerism is not possible at site (s) :
(1) I (2) III (3) I and III (4) I and IV

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

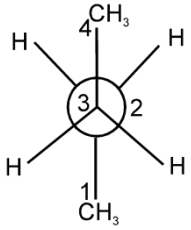
*** Marked Questions may have more than one correct option.**

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

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

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

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



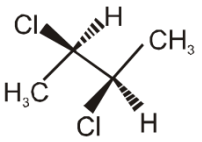
(A) staggered (B) fully eclipsed (C) gauche (D) partially eclipsed

5. **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]

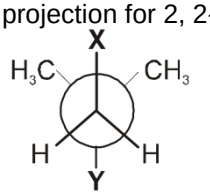
(A) The compound is optically active
(B) The compound possesses centre of symmetry
(C) The compound possesses plane of symmetry
(D) The compound possesses axis of symmetry

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]**

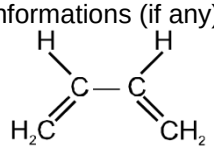
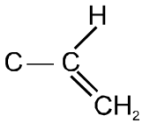
9.* In the Newman projection for 2, 2-Dimethylbutane



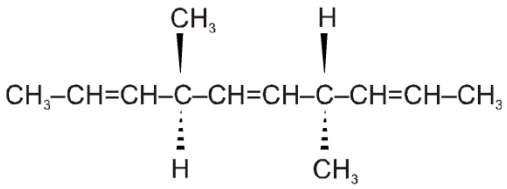
X and **Y** can respectively be : **[IIT-JEE-2010, 3/163]**

(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) $H_2C=C=CH_2$

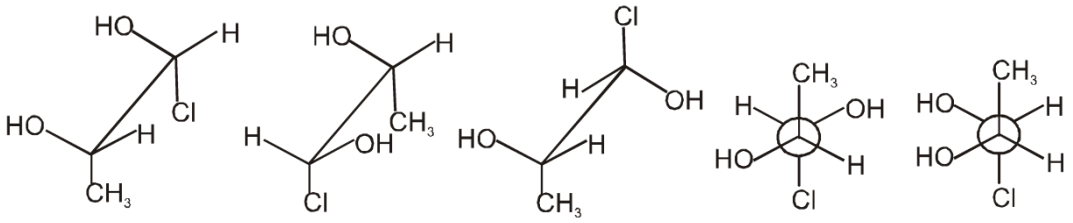
11. The number of optically active products obtained from the **complete** ozonolysis of the given compound is:



[IIT-JEE- 2012, 3/136]

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

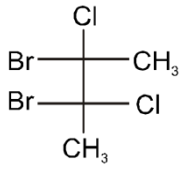
12.* Which of the given statement(s) about N, O, P and Q with respect to M is (are) correct ?
[IIT-JEE- 2012, 4/136]



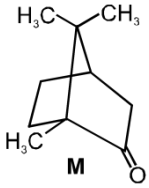
M N O P Q

(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]**

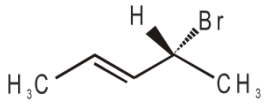
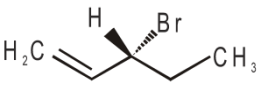
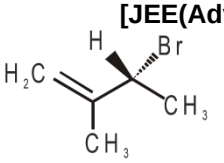
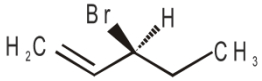


14. The total number of stereoisomers that can exist for **M** is **[JEE(Advanced)-2015, 4/168]**



M

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

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

Answers

EXERCISE - 1

A-1.	(3)	**A-2.**	(4)	**A-3.**	(4)	**A-4.**	(1)	**A-5.**	(4)
B-1.	(1)	**B-2.**	(4)	**B-3.**	(4)	**B-4.**	(3)	**B-5.**	(4)
C-1.	(2)	**C-2.**	(2)	**C-3.**	(3)	**D-1.**	(3)	**D-2.**	(2)
D-3.	(1)	**D-4.**	(1)	**D-5.**	(1)	**D-6.**	(4)	**E-1.**	(4)
E-2.	(3)	**E-3.**	(2)	**E-4.**	(1)	**F-1.**	(4)	**F-2.**	(4)
F-3.	(4)	**F-4.**	(1)	**F-5.**	(2)	**F-6.**	(2)	**F-7.**	(2)
G-1.	(4)	**G-2.**	(2)	**G-3.**	(3)	**H-1.**	(1)	**H-2.**	(1)
H-3.	(4)	**I-1.**	(4)	**I-2.**	(1)	**I-3.**	(1)	**I-4.**	(4)
I-5.	(3)	**J-1.**	(1)	**J-2.**	(3)	**J-3.**	(2)	**J-4.**	(3)
J-5.	(1)	**J-6.**	(4)	**K-1.**	(3)	**K-2.**	(3)	**K-3.**	(2)
K-4.	(3)	**K-5.**	(3)	**L-1.**	(4)	**L-2.**	(1)	**L-3.**	(1)
L-4.	(3)	**L-5.**	(2)	**L-6.**	(4)	**M-1.**	(2)	**M-2.**	(2)
M-3.	(2)	**M-4.**	(2)	**M-5.**	(2)	**M-6.**	(2)	**M-7.**	(1)
M-8.	(2)	**M-9.**	(3)	**M-10.**	(2)	**M-11.**	(2)	**M-12.**	(3)
M-13.	(2)	**M-14.**	(2)						

EXERCISE - 2

PART-I

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

PART-II

A-1.	(4)	**A-2.**	(1)	**A-3.**	(4)	**A-4.**	(1)		
B-1.	(A - p) ; (B - p) ; (C - s) ; (D - r)			**C-1.**	(1,2,3)	**C-2.**	(1,3,4)	**C-3.**	(1,3)
C-4.	(2, 4)	**C-5.**	(1, 4)	**C-6.**	(1, 2)	**C-7.**	(2, 4)		

EXERCISE - 3

PART - I

OFFLINE JEE-MAIN

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

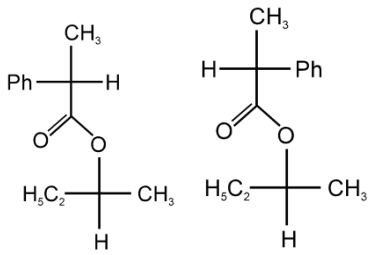
ONLINE JEE-MAIN

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

PART - II

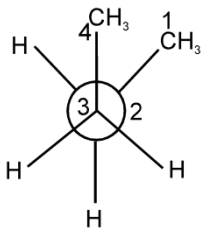
1. (A)

2.



(+) (+)-ester + (–) (+)-ester

3. Least stable staggered form of n–butane is



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

4.	(C)	**5.**	(C)	**6.***	(AD)	**7.**	(AD)	**8.**	(7)
9.*	(BD)	**10.***	(BC)	**11.**	(A)	**12.***	(ABC)	**13.**	(3)
14.	(2)	**15.**	(BD)						

Additional Problems For Self Practice (APSP)

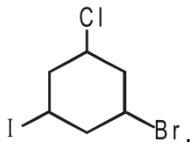
PART - I : PRACTICE TEST PAPER

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.**

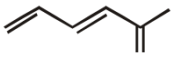
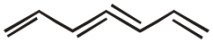
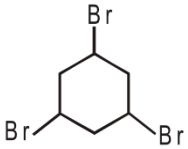
Important Instructions

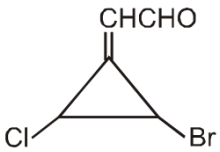
1. The test is of **1 hour** duration.
2. The Test Booklet consists of **30** questions. The maximum marks are **120.**
3. Each question is allotted **4 (four)** marks for correct response.
4. Candidates will be awarded marks as stated above in Instructions No. 3 for correct response of each question.
   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

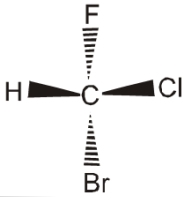
3. Which of the following has highest number of geometrical isomers
(1) 
(2) 
(3) 

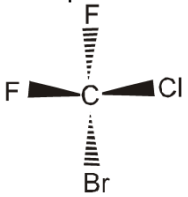
(4) 

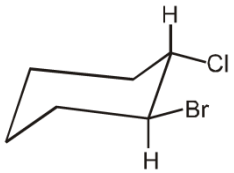
4. Total number of position isomers of trichlorocyclohexane which can show geometrical isomerism.
(1) 2 (2) 3 (3) 4 (4) 6

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) 

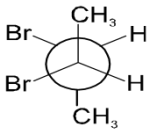
(2) 

(3) 

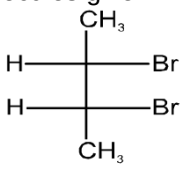
(4) More than one of these

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

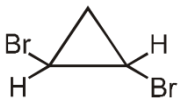


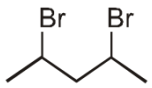
III

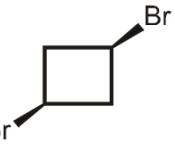
(1) Identical (2) Enantiomers (3) Diastereomers (4) Conformers

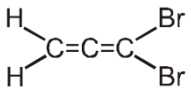
10. Which of the following compounds exhibits stereoisomerism ?
(1) 2-methylbutene-1 (2) 3-methylbutyne-1
(3) 3-methylbutanoic acid (4) 2-methylbutanoic acid

11. Identify the chiral species among the following :

(1) 

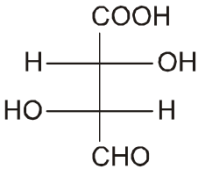
(2) 

(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

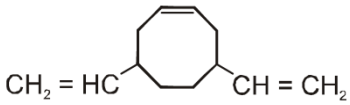
13. The configurations of the carbon atoms C_2 and C_3 in the following compound are respectively.



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

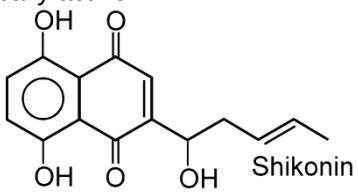
14. Which of the following will not show geometrical isomerism ?

(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.

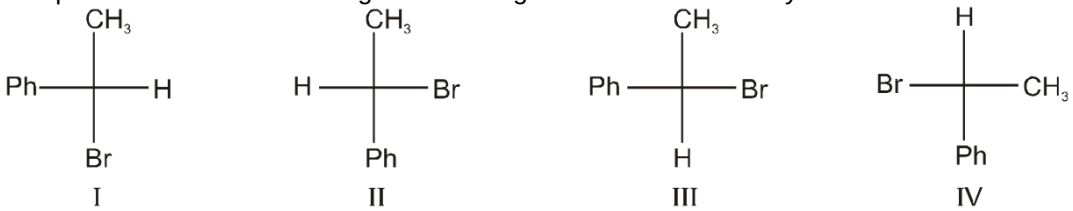
19. How many different alcohols (including optical isomers) are possible with the molecular formula $C_4H_{10}O$?
(1) 3 (2) 4 (3) 5 (4) 6

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 :



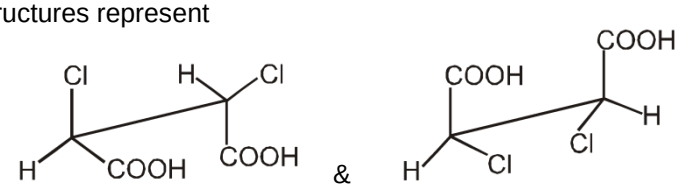
(1) I and IV (2) II and IV (3) II and III (4) I and II

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

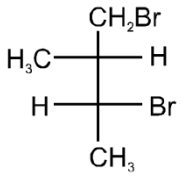


(1) geometrical isomers (2) positional isomers
(3) conformational isomers (4) configurational isomers

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

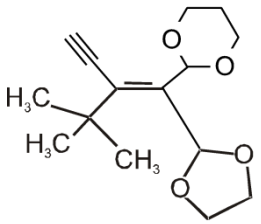
1. How many optically active stereoisomers are possible for Butane -2,3-diol ?
(1) 1 (2) 2 (3) 3 (4) 4.

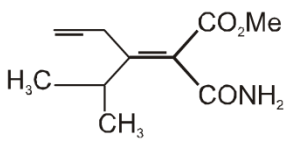
2. Which one of the following pair represents stereo isomerism :
(1) Linkage isomerism and Geometrical isomerism
(2) Chain isomerism and Rotational isomerism
(3) Optical isomerism and Geometrical isomerism
(4) Structural isomerism and Geometrical isomerism.

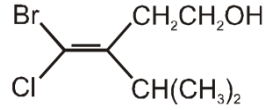
3. Which of the following is not chiral ?
(1) 2–Butanol (2) 2, 3–Dibromo pentane
(3) 3–Bromo pentane (4) 2–Hydroxy propanoic acid

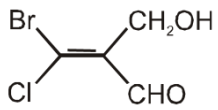
4. Among the following which one can have a meso form ?
(1) $CH_3CH(OH)CH(Cl)C_2H_5$ (2) $CH_3CH(OH)CH(OH)CH_3$
(3) $C_2H_5CH(OH)CH(OH)CH_3$ (4) $HOCH_2CH(Cl)CH_3$

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

(A) 

(B) 

(C) 

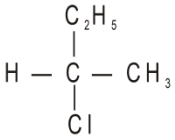
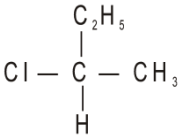
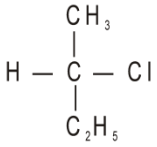
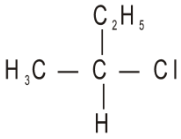
(D) 

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

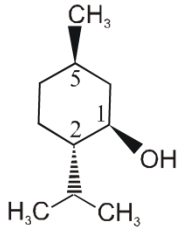
(1) centre of symmetry (2) axis of symmetry (C_2)

(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

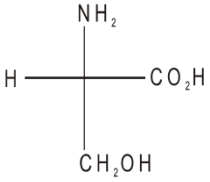
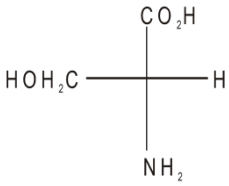
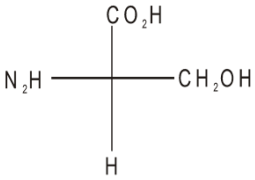
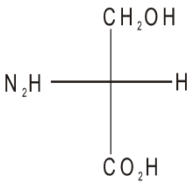


(1) 1R, 2R, 5R (2) 1S, 2S, 5S (3) 1R, 2S, 5R (4) 1S, 2R, 5S

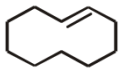
9. Which of the following acids does not exhibit optical isomerism ?

(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

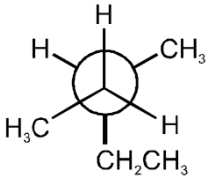
(3) Eclipse, Anti, Gauche (4) Anti, Gauche, Eclipse

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

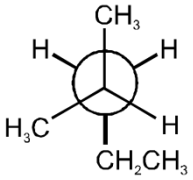
(1) 1, 2-trans and1, 3-cis (2) 1, 2-cis and 1,3-trans

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

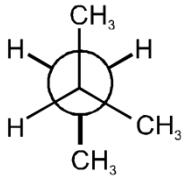
15. The correct conformational structure of 2-methylpentane is :



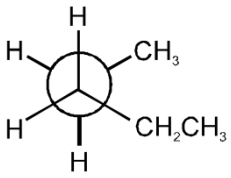
(1)



(2)

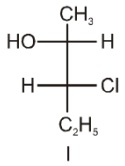


(3)

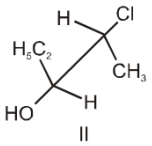


(4)

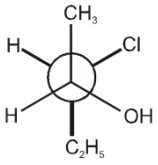
16. The two projection formulae that represent a pair of enantiomers are.



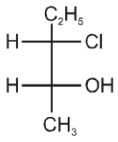
I



II



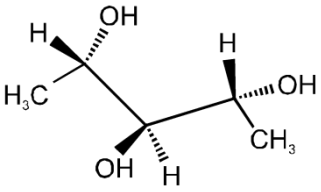
III

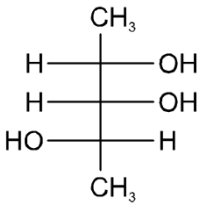


IV

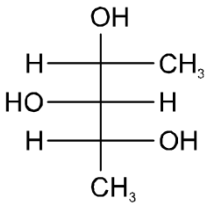
(1) I and II (2) III and IV (3) I and III (4) II and IV

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

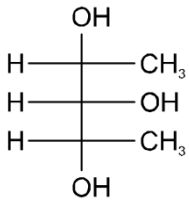




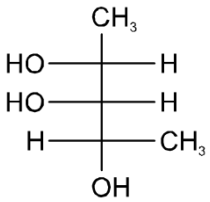
(1)



(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)				