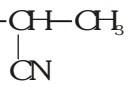
SELECT THE CORRECT ALTERNATIVE (ONLY ONE CORRECT ANSWER)

1. Type of isomerism exists between :-

$CH_3—CH_2—CH_2—CN$ and 

(A) Position (B) Chain (C) Both the above (D) None of these

2. The number of primary alcohols possible with the formula $C_4H_{10}O$ is -

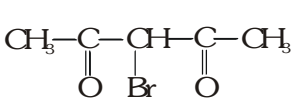
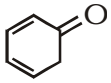
(A) 2 (B) 3 (C) 4 (D) 5

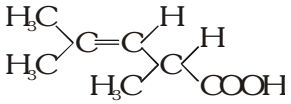
3. The total number of benzene derivatives having the molecular formula C_7H_7Cl is -

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

4. Which of the following will lead to maximum enolisation :–

(A) CH_3COCH_3 (B) CH_3COCH_2CHO

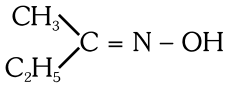
(C)  (D) 

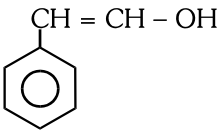
5.  Exhibits :-

(A) Tautomerism (B) Optical isomerism

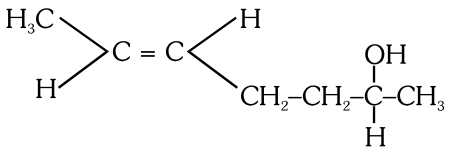
(C) Geometrical isomerism (D) Geometrical and optical isomerism

6. Tautomerism is not exhibited by :-

(A)  (B) $(CH_3)_2CHNO_2$

(C)  (D) $(CH_3)_3CCHO$

7. Given compound exhibits x geometrical isomers and y optical isomers



The value of x and y respectively are :-

(A) 4 and 4 (B) 2 and 2 (C) 2 and 4 (D) 4 and 2

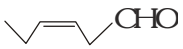
8. The total number of cyclic compounds (neglecting stereoisomers) with the molecular formula C_5H_{10} is -

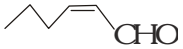
(A) 4 (B) 5 (C) 6 (D) 7

9. Which of the following exhibits tautomerism ?

(A) $(CH_3)_2NH$ (B) $(CH_3)_3CNO_2$ (C) R_3CNO_2 (D) RCH_2NO_2

10. The correct structure of trans–2–hexenal is -

(A)  (B) 

(C)  (D) 

11. The total number of benzene derivatives having the molecular formula C_7H_8O is -

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

12. Which of the following compounds does not exhibit tautomerism

(A) CH_3NO_2 (B) $CH_3CH_2NO_2$

(C) $C_6H_5CH=CH–OH$ (D) CH_3CH_2OH

13. The total number of benzene derivatives with the molecular formula $C_6H_3Cl_3$ is -

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

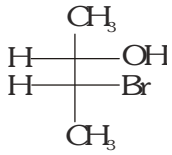
14. Which of the following compounds is not chiral ?

(A) $DCH_2CH_2CH_2Cl$ (B) CH_3CHDCH_2Cl (C) $CH_3CHClCH_2D$ (D) CH_3CH_2CHDCl

15. The total number of stereoisomers of 2,3–dibromobutane is -

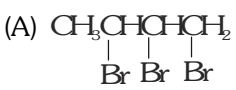
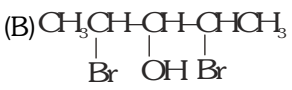
(A) 2 (B) 3 (C) 4 (D) 5

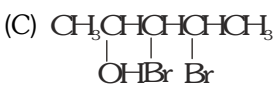
16. In the structure :

 the configurations at the chiral centres are :

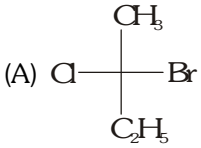
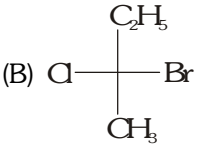
(A) 2R, 3R (B) 2S, 3R (C) 2R, 3S (D) 2S, 3S

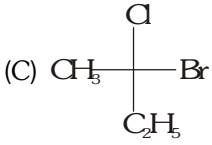
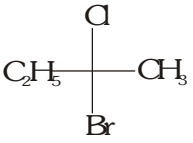
17. Which of the following compound contains a pseudo-asymmetric carbon atom

(A)  (B) 

(C)  (D) 

18. Consider the following structures (A), (B), (C) and (D) -

(A)  (B) 

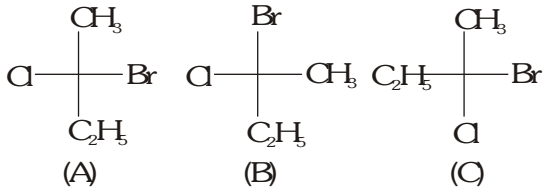
(C)  (D) 

Which of the following statements is not correct

(A) B and C are identical (B) A and B are enantiomers

(C) A and C are enantiomers (D) B and D are enantiomers

19. The interchange of two groups (Br and CH_3) at the chiral centre of the projection formula (A) yields the formula (B), while the interchange of another set of two groups (C_2H_5 and Cl) of (A) yields the projection formula (C) -



(A) (B) (C)

Which of the following statements is not correct about the structures (A), (B) and (C) -

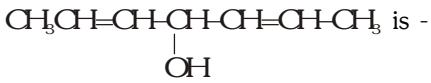
(A) B and C are identical (B) A and C are enantiomers

(C) B and C are enantiomers (D) A and B are enantiomers

20. How many meso stereoisomers are possible for 2, 3, 4-pentanetriol -

(A) 1 (B) 2 (C) 3 (D) none of these

21. The total number of stereoisomers of the compound

 is -

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

22. The total number of aldehydes and ketones with the molecular formula C_4H_8O is -

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

23. In which of the following properties do enantiomers differ from each other

(A) Solubility in an achiral solvent (B) Reactivity with an achiral reagent

(C) Melting point (D) Optical rotation

24. (+) - Mandelic acid has a specific rotation of + 158°. What would be the observed specific rotation of a mixture of 25% (–) -mandelic acid and 75% (+) -mandelidc acid :

(A) + 118.5° (B) –118.5° (C) – 79° (D) + 79°

25. When $C_6H_4Cl_2$ is converted into $C_6H_3Cl_3$, o-isomer will give m types of $C_6H_3Cl_3$, and p-isomer will give q types of $C_6H_3Cl_3$. m, n, q are respectively :

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

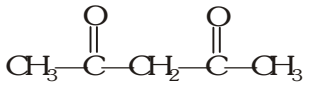
CHECK YOUR GRASP	ANSWER KEY	EXERCISE -1

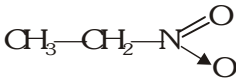
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	B	A	C	D	B	D	B	A	D	B	C	D	B	A	B	B	B	D	C	D
Que.	21	22	23	24	25															
Ans.	C	B	B	D	B															

SELECT THE CORRECT ALTERNATIVES (ONE OR MORE THEN ONE CORRECT ANSWERS)

1. Tautomerism is shown by :-

(A) HCN

(B) 

(C) 

(D) CCl_3CHO

2. In which of the following cases, cis-trans nomenclature can not be used :-

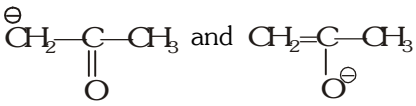
(A) Cl—CH=CH—Cl

(B) CH_3—CH=CH—CHO

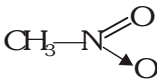
(C) C_6H_5—N=N—C_6H_5

(D) CH_3—CH=C(Cl)C_2H_5

3. Among the following, which are tautomers :-

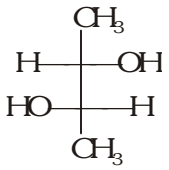
(A) 

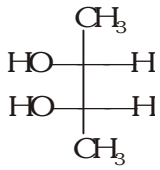
(B) CH_3—CH_2—CH=NH and CH_3—CH=CH—NH_2

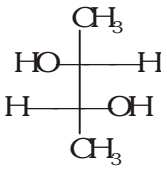
(C)  and CH_3—CH=N—OH

(D) glucose and fructose

4. Consider the following compounds :


(I)


(II)


(III)

Choose the correct statements :

(A) I and III are enantiomers

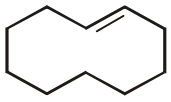
(B) I and II are diastereomers

(C) II and III are diastereomers

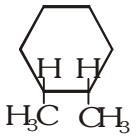
(D) I, II and III are all optically active

5. Which will show geometrical isomerism :-

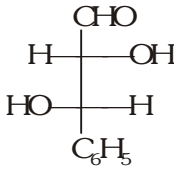
(A) C_6H_5–CH=NOH

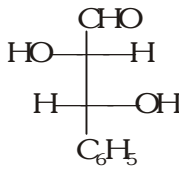
(B) 

(C) C_6H_5–N=N–C_6H_5

(D) 

6. Which statement (s) is/are correct for :-


(I)


(II)

(A) Both are in threo form

(B) Both are enantiomers

(C) Both are diastereomers

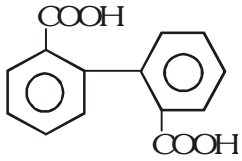
(D) Both are in erythro form

7. Which of the following compounds are chiral and resolvable :-

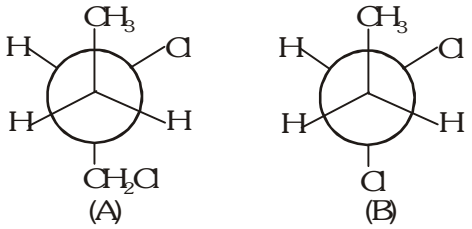
(A) $C_6H_5N(CH_3)\ (C_2H_5)$

(B) $[C_6H_5\overset{+}{N}(CH_3)\ (C_2H_5)\ (C_3H_7)]\ Cl^-$

(C) $CH_3–CH_2–CH(CH_3)\ N\ (CH_3)\ (C_2H_5)$

(D) 

8. Observe the following structures and pick up the correct option (s) mentioned below :-



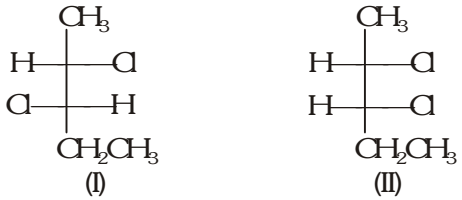
(A) (B)

(A) The two are position isomers

(B) None of the two shows optical isomerism

(C) Only A shows optical isomerism

(D) The two are not related to each other regarding isomerism

9. 

(I) (II)

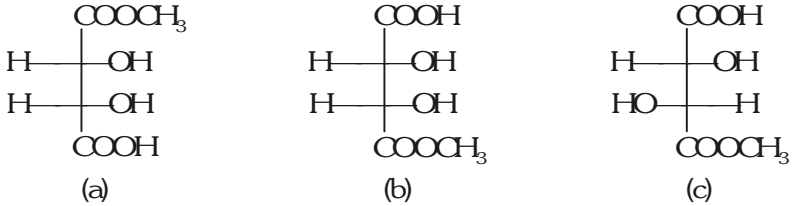
(A) I and II are enantiomers

(B) I is 2S, 3S; while II is 2S, 3R

(C) I is 2R, 3R; While II is 2R, 3S

(D) I and II are diastereomers

10. Which of the following statements are true regarding following structures :-



(a) (b) (c)

(A) A and B are diastereomers

(B) A and C are diastereomers

(C) B and C are diastereomers

(D) A and B are enantiomers

11. The R and S enantiomers of an optically active compound differ in :-

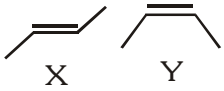
(A) their reactivity with chiral reagents

(B) their melting points

(C) their optical rotation of plane polarized light

(D) their solubility in achiral reagents

12. Which of the following statements (s) is (are) incorrect :-

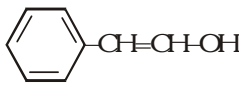
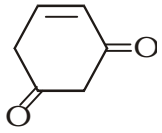
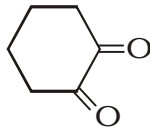


(A) X is cis- and Y is trans
(B) X is Z and Y is E
(C) X is trans and Y is cis
(D) X and Y are diastereomers

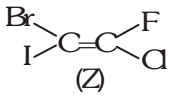
13. Which of the following compounds will show geometrical isomerism :-

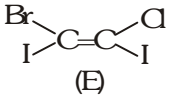
(A) 2-butene (B) propene (C) 1-phenylpropene (D) 2-methyl-2-butene

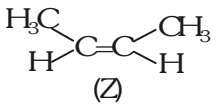
14. Tautomerism is exhibited by :-

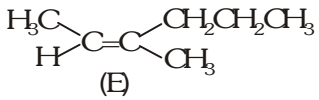
(A) 
(B) 
(C) 
(D) 

15. Which of the following notations are correct :

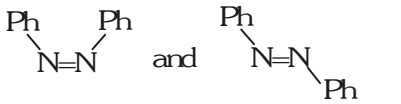
(A) 
(Z)

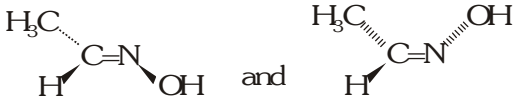
(B) 
(E)

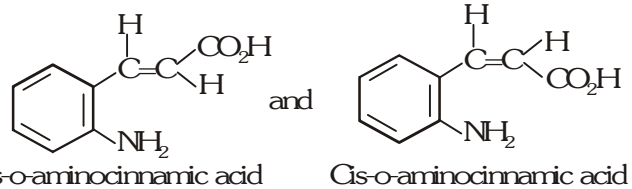
(C) 
(Z)

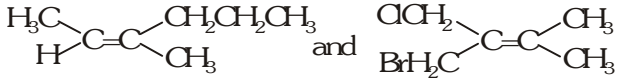
(D) 
(E)

16. For which of the following pairs of compounds are the correct notation given :-

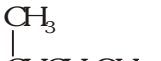
(A) 
Anti-azobenzene Syn-azobenzene

(B) 
Syn-acetaldoxime Anti-acetaldoxime

(C) 
Trans-o-aminocinnamic acid Cis-o-aminocinnamic acid

(D) 
Z-isomer E-isomer

17. Which of the following statements are correct :-

(A) $CH_3CH_2CH_2CH_2OH$ and  represent chain isomerism

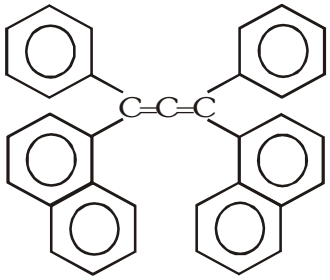
(B) $CH_3CH_2CH_2CH=CH_2$ and $CH_3CH_2CH = CHCH_3$ are examples of position isomerism

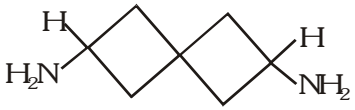
(C) $C_2H_5OCH_3$ and $CH_3CH_2CH_2OH$ represent functional-group isomerism

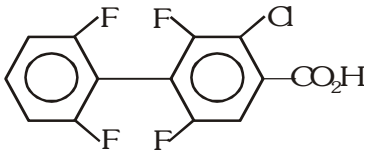
(D) $CH_3CH_2NH_2$ and CH_3NHCH_3 are examples of metamerism

18. Which of the following are optically active :-

(A) $H_2C=C=CH_2$

(B) 

(C) 

(D) 

19. An enantiomerically pure acid is treated with racemic mixture of an alcohol having one chiral carbon. The ester formed will be :

(A) optically active mixture (B) pure enantiomer

(C) meso compound (D) racemic mixture

20. Tartaric acid molecule contains two asymmetric carbon atoms. The number of optical isomers of tartaric acid is :-

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

BRAIN TEASERS						ANSWER KEY									EXERCISE -2
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	A,B,C	B,C,D	B,C	A,B,C	A,B,C,D	A,B	B,C	A,C	B,D	B,C,D	A,C	A,B	A,C	A,C,D	A,C
Que.	16	17	18	19	20										
Ans.	B,C,D	A,B,C,D	B,C	A	B										

TRUE OR FALSE :

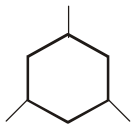
1. Stereo-isomers which are not mirror image of each other are known as diastereoisomers.
2. In every case, a pair of enantiomers have a mirror-image relationship.
3. If a compound has an enantiomer it must be chiral.
4. If a compound has a diastereomer it must be chiral
5. Any molecule containing a stereocentre must be chiral.
6. Any chiral compound with a single asymmetric carbon must have a positive optical rotation if the compound has the R configuration.

FILL IN THE BLANKS :

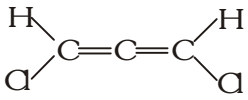
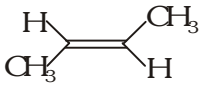
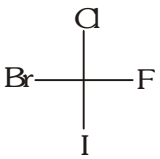
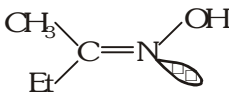
1. The possible number of dichloro derivatives of propane are ..... .
2. Ethyl benzene is ..... isomer to xylenes.
3. The compound CHCl = CHCl can show ..... isomerism.
4. d- and ℓ- lactic acid are known as ..... .
5. Maleic and fumaric acids are a pair of ..... .

MATCH THE COLUMN

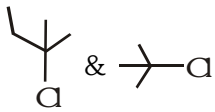
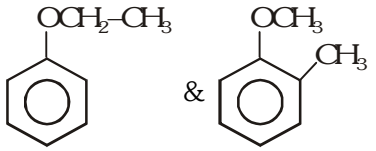
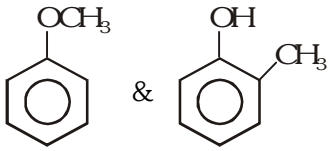
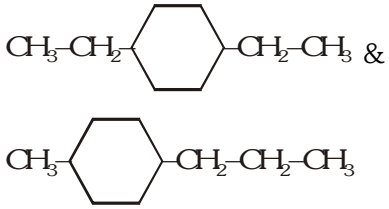
1. Match the column I with column II.

Column-I (reaction)		Column-II (stereoisomers)	
(A)	$CH_3—CH=CH—CH=N—OH$	(p)	2
(B)		(q)	4
(C)	$CH_3—CH=CH—CH=CH—CH=CH—CH_3$	(r)	6
(D)	$CH_3—CH=CH—CH=CH—CH=CH—Ph$	(s)	8

2. Match the following compounds of column I with column II.

Column-I (Molecule)		Column-II (Property)	
(A)		(p)	Chiral compound
(B)		(q)	Presence of stereocenter
(C)		(r)	Optically active compound
(D)		(s)	Compound containing plane of symmetry

3. Match the column I with column II.

Column-I (reaction)		Column-II (stereoisomers)	
(A)		(p)	Homologs
(B)		(q)	Functional isomers
(C)		(r)	Metamer
(D)		(s)	Chain isomers

ASSERTION & REASON QUESTION :

These questions contains, Statement-I (assertion) and Statement-II (reason).
(A) Statement-I is True, Statement-II is True ; Statement-II is a correct explanation for Statement-I
(B) Statement-I is True, Statement-II is True ; Statement-II is NOT a correct explanation for Statement-I
(C) Statement-I is True, Statement-II is False.
(D) Statement-I is False, Statement-II is True.

1. **Statement-I :** Staggered and eclipsed ethane can not be separated.

   Because

   Statement-II : Energy barrier between staggered and eclipsed form of ethane is 12.6 kJ/mole.

2. **Statement-I :** All double bond containing compounds show geometrical isomerism.

   Because

   Statement-II : Alkenes have restricted rotation about the double bond.

3. **Statement-I :** Meso-tartaric acid is optically active.

   Because

   Statement-II : Optically active molecule is a molecule that cannot be superimposed on its mirror image.

4. **Statement-I :** Cyclohexanone exhibits keto-enol tautomerism.

   Because

   Statement-II : In cyclohexanone, one form contains the keto group (C=O) while other contains enolic group (–C=C–OH).

5. **Statement-I :** Staggered form is less stable than the eclipsed form.

   Because

   Statement-II : The conformation in which the bond pairs of two central atoms are very far from one another is called staggered from.

6. **Statement-I :** Trans-isomers are more stable than cis-isomer.

Because

Statement-II : The cis-isomer is the one in which two similar groups are on the same side of double bond.

7. **Statement-I :** Propadiene is optically inactive.

Because

Statement-II : Propadiene has a plane of symmetry.

COMPREHENSION BASED QUESTIONS :

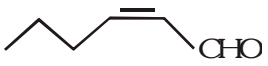
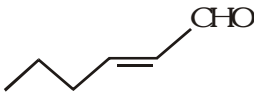
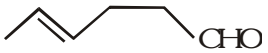
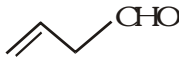
Comprehension # 1

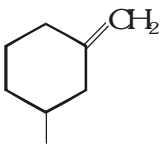
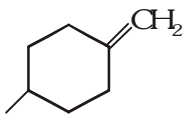
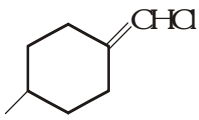
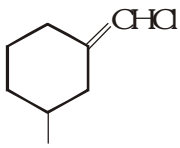
Geometrical isomerism is a kind of stereoisomerism which is present in the compounds containing a double bond (C=C, C=N, N=N) and arise due to the restricted or frozen rotation about the double bond. The atoms or groups attached to the doubly bonded carbons must be different. In aldoximes, the isomer is named as syn if hydrogen and hydroxyl groups are on the same side of C=N bond and if these are on opposite sides, the isomer is named as anti. In ketoximes, the prefixes syn and anti indicate which group of ketoxime is syn or anti to hydroxyl group.

1. Which of the following does not show geometrical isomerism ?
   (A) 1,2-Dichloropent-1-ene (B) 1,3-Dichloropent-2-ene
   (C) 1,1-Dichloropent-1-ene (D) 1,4-Dichloropent-2-ene

2. On treating with NH_2OH, which can form two products ?
   (A) Acetaldehyde (B) Acetone
   (C) Formaldehyde (D) Benzophenone

3. Number of stereoisomers of the compound 2-chloro-4-methylhex-2-ene is/are
   (A) 1 (B) 2 (C) 4 (D) 16

4. The correct structure of trans-2-hexenal is -
   (A) 
   (B) 
   (C) 
   (D) 

5. The geometrical isomerism is shown by :
   (A) 
   (B) 
   (C) 
   (D) 

Comprehension # 2

The optical isomers rotate the plane of plane-polarised light. A sp^3-hybridised carbon atom attached to four different atoms or groups is called an asymmetrical centre or chiral centre. Chiral molecules do not possess any of the elements of symmetry. A chiral molecule cannot be superimposed on its mirror image. These stereoisomers are called enantiomers. Molecules having a plane of symmetry or centre of symmetry are superimposable on their mirror images and are achiral. The stereoisomers that are not mirror images of each other are called diastereomers. A mesoisomer has a plane of symmetry and is optically inactive due to internal compensation.

1. Which of the following has a meso isomer also ?

(A) 2-Chlorobutane (B) 2-3, Dichlorobutane

(C) 2, 3-Dichloropentane (D) 2-Hydroxypentanoic acid

2. Which of the following compounds is not chiral ?

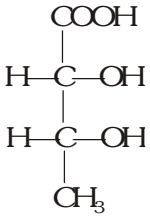
(A) $DCH_2CH_2CH_2Cl$ (B) CH_3CH_2CHDCl

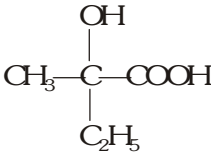
(C) CH_3CHDCH_2Cl (D) $CH_3CHClCH_2D$

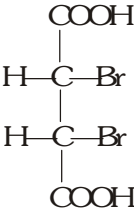
3. The total number of acylic isomers including the stereoisomers (geometrical and optical) possible with the molecular formula C_4H_7Cl is :

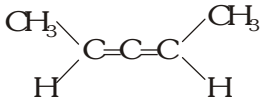
(A) 12 (B) 11 (C) 10 (D) 9

4. Which among the following compounds will be dissymmetric but not asymmetric :

(A) 

(B) 

(C) 

(D) 

5. Two isomeric alkenes A and B have molecular formula C_5H_9Cl. On adding H_2, A gives optically inactive compound while B gives chiral compound. The two isomers are :

(A) A is 3-Chlorpoent-1-ene and B is 1-chloropent-2-ene

(B) A is 2-Chloro-3-methylbut-2-ene while B is 1-Chloro-3-methylbut-1-ene

(C) A is 3-Chloropent-2-ene and B is 2-Chloropent-2-ene

(D) A is 4-Chloropent-2-ene and B is 4-Chloropent-1-ene

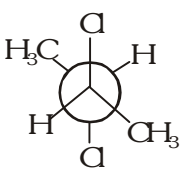
Comprehension # 3

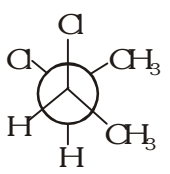
Different spatial arrangements of the atoms that result from rotation about a single bond are conformers. n-Butane has four conformers eclipsed, fully eclipsed, gauche and anti. The stability order of these conformers are as follows :

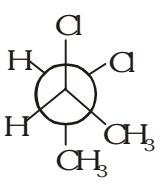
Anti > gauche > Partial eclipsed > Fully eclipsed

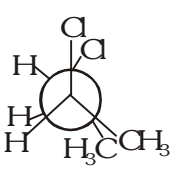
Although anti is more stable than gauche but in some cases gauche is more stable than anti.

1. Which one of the following is most stable conformer :

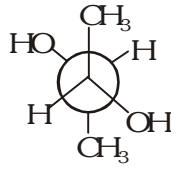
(A) 

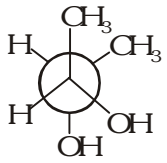
(B) 

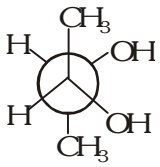
(C) 

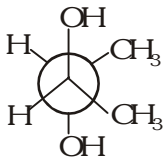
(D) 

2. Which one of the following is the most stable conformer ?

(A) 

(B) 

(C) 

(D) 

3. Number of possible conformers of n-butane is :

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

MISCELLANEOUS TYPE QUESTION — ANSWER KEY — EXERCISE -3

- ***True / False***

  1. T **2.** T **3.** T **4.** F **5.** T **6.** F

- ***Fill in the Blanks***

  1. four **2.** chain **3.** geometrical **4.** enantiomer

  5. geometrical

- ***Match the Column***

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

  3. (A) → p ; (B) → r ; (C) → q ; (D) → r, s

- ***Assertion - Reason Questions***

  1. A **2.** D **3.** D **4.** B **5.** D

  6. B **7.** A

- ***Comprehension Based Questions***

  Comprehension #1 : 1. (C) **2.** (A) **3.** (C) **4.** (B) **5.** (D)

  Comprehension #2 : 1. (B) **2.** (A) **3.** (C) **4.** (D) **5.** (C)

  Comprehension #3 : 1. (A) **2.** (C) **3.** (D)

SUBJECTIVE QUESTIONS :

1. How many isomers are there corresponding to the formula $C_4H_{10}O$?

2. If the bonds in dichloro benzene, $C_6H_4Cl_2$, were localized between specific carbon atoms, how may isomers of this compound would exist ? How many isomers actually exists.

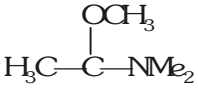
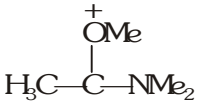
3. Which of the following compounds can exist as geometric isomers ?
CH_2Cl_2, $CH_2Cl—CH_2Cl$, $CHBr = CHCl$, $CH_2Cl—CH_2Br$.

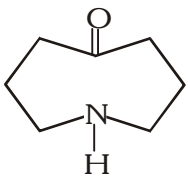
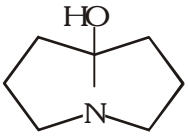
4. How will you distinguish between Maleic acid and Fumaric acid ?

5. Why does cyclopentene not exhibit geometric isomerism though it has a double bond.

6. Why does 2-butene exhibit cis-trans isomerism but 2-yne does not ?

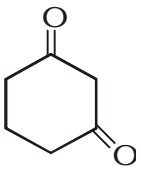
7. Which of the following pairs show tautomerism.

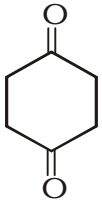
(a)  and 

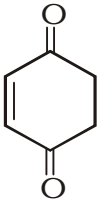
(b)  and 

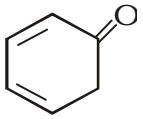
8. Write structural isomer of C_6H_{14}. What is relation between them ?

9. Arrange the following in the order of their enolic content :

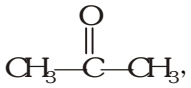

I

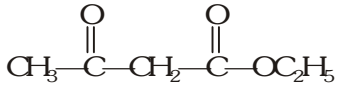

II

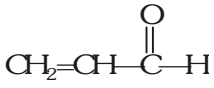

III

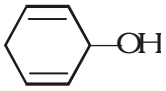

IV

10. Which of the following does/do not exhibits tautomerism.

(i)  ,

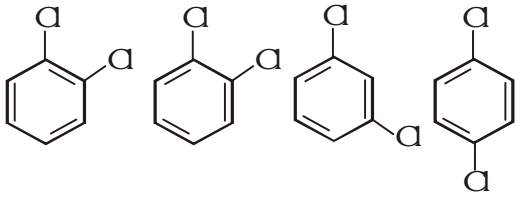
(ii) 

(iii) 

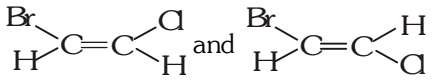
(iv) 

1. There are 7—1-butanol, 2-butanol, 2-methyl-1-propanol, 2-methyl-2-propanol, diethyl ether, methyl propyl ether, and methylisopropyl ether.

2. If the bonds were localized, there would be 4 isomers ; actually there are only 3 of the following, the first two are identical, because the bods are not localized.

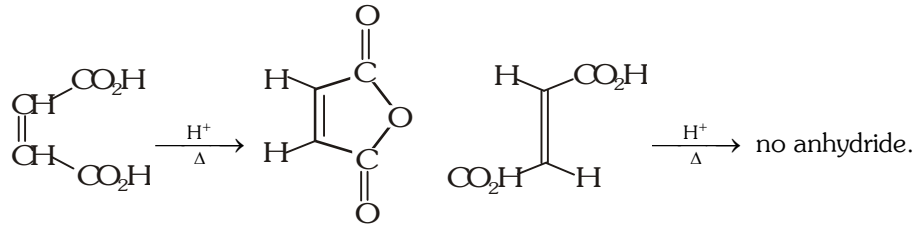


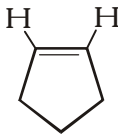
3. Only CHBr = CHCl can exist as geometric isomers :



In CH_2Cl— CH_2Cl and CH_2Cl—CH_2Br, the carbon atoms are connected by a single bond about which the groups can rotate relatively freely. Thus any conformation of the halogen atoms may be converted into any other simply by rotation about the single bond. In CH_2Cl_2, the configuration of the molecule is tetrahedral and all interchanges of atoms yield exactly equivalent configurations.

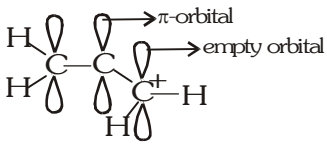
4. Maleic acid forms an anhydride where as fumaric acid does not.



5.  This is cis form. Two H atoms on the same side. To get trans, ring must be twisted.

Double bond becomes severely twisted-destabilized. Effective overlap of P orbitals is missing, so does not exist.

6. The P_z orbitals forming π-bonds and the empty P_z orbital of the carbon with +ve charge are parallel. So the electrons may be delocalized. The +ve charge is effectively spread out over two carbons; delocalized.



$CH_2=CH-\overset{+}{C}H_2 \longleftrightarrow \overset{+}{C}H_2-CH=CH$

In n-propyl cation, + I effect of R increases the stability.

In allyl + M effect increases the stability. But + M effect in allyl cation is more effective. So allyl > propyl.

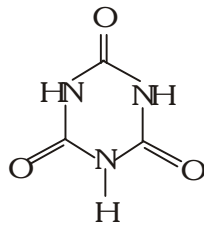
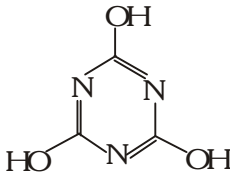
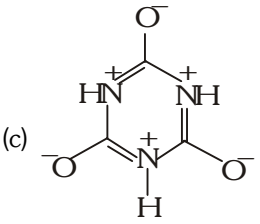
A group with + M effect stabilizes cation; destabilizes anion.

7. Lone pair - pπ conjugation between fluorine and carbon will be more effective than between chlorine and carbon.

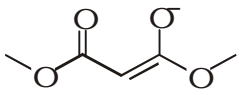
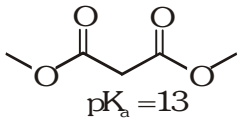
9. III > IV > I > II

SUBJECTIVE QUESTIONS :

1. What is relation between (a), (b), (c) ?

(a)  (b)  (c) 

2. Which side is favoured at equilibrium, provide quantitative explanation :

 $+H_2O$ $pK_a = 16$  $+ HO^-$ $pK_a = 13$

3. (+) 2-butanol has specific rotation of + 13.9° when measured in pure form. A sample of 2-butanol was found to have an optical rotation of –3°. What is the stereomeric composition of this mixture ?

4. N-methylethenamine as such does not show any stereoisomerism but one of its resonance form exhibit stereoisomerism. Explain.

5. Assign Cahn-ingold prelog priorites to the following sets of substituents :

(i) —H, —Br, $—CH_2CH_3$, $—CH_2CH_2OH$ (ii) —COOH, $—COOCH_3$, $—CH_2OH$, —OH

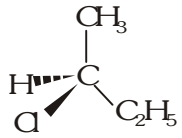
(iii) —CN, $—CH_2NH_2$, $—CH_2NHCH_3$, $—NH_2$ (iv) —Br, $—CH_2Br$, —Cl, $—CH_2Cl$

6. Identify whether the stereogenic centre is present or not :

(i) 2-Cyclo penten-1-ol (ii) 3-cyclo penten-1-ol (iii) 2-bromopentane (iii) 3-bromopentane

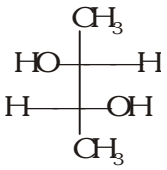
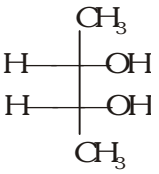
7. Discuss the optical activity of tertiary amines of the type $R_1R_2R_3N$:

8. Draw the enantiomer of the following structure :



9. 2,4-Hexadiene has three geometrical isomers. Draw their structures.

10. Assign R and S configuration to the chiral carbons in the following :

(i)  (ii) 

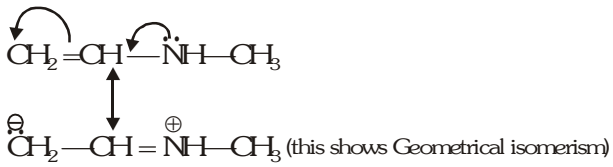
1. a & b are tautomers and a & c are resonating structures.

3. Let x is the % of (+) 2-butanol.

13.9 x – 13.9 (100 – x) = – 300.

x = 39.2, % of d form = 39.2, % of ℓ form = 60.8.

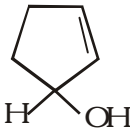
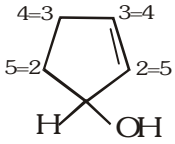
4.

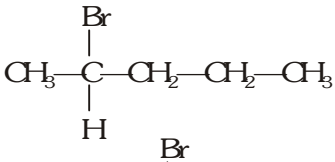


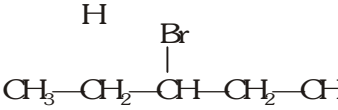
(this shows Geometrical isomerism)

5. (a) —Br > —CH_2CH_2OH > —CH_2CH_3 >— H, (b) —OH > —$COOCH_3$ >—COOH >—CH_2OH

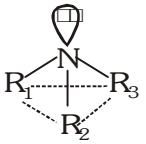
(c) —NH_2 >—CN >—CH_2NHCH_3 >—CH_2NH_2 (d) —Br >—Cl >—CH_2Br >—CH_2Cl

6. (i)  Hydroxyl bearing carbon is stereogenic centre., (ii)  It has no stereogenic centre.

(iii)  bromine bearing carbon is stereogenic centre.

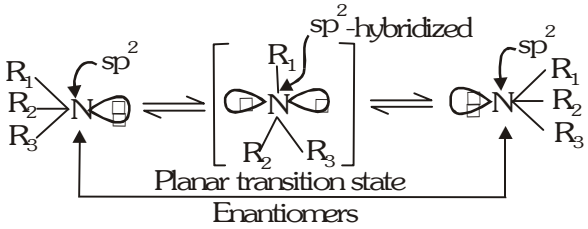
(vi)  It has no stereogenic centre.

7. Tertiary amines have pyramideal geometry with sp^3-hybridization at nitrogen.

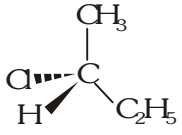


It should be a chiral molecule (assuming lone pair to be a substituent). Thus, tertiary amines exist as racemic mixture but they cannot be resolved.

This is due to the reason that the energy difference between the isomer is very small (25 kJ mol^{-1}). Hence, rapid nitrogen or amine inversion takes palce.



Tertiary amine N-oxide has four group hence nitrogen inversion is not possible, thus tertiary amine -N-oxide can be resolved.

8. 

10. (i) 2R, 3R (ii) 2S, 3R

1. Recemic mixture is formed by mixing two- [AIEEE-2002]

(1) isomeric compounds (2) chiral compounds

(3) meso compounds (4) enantiomers with chiral carbon

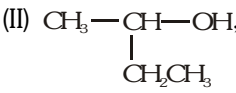
2. Geometrical isomerism is not shown by- [AIEEE-2002]

(1) 1,1–dichloro–1–pentene (2) 1,2–dichloro–1–pentene

(3) 1,3–dichloro–2–pentene (4) 1,4–dichloro–2–pentene

3. Following types of compounds I and II [AIEEE-2002]

(I) $CH_3CH=CHCH_3$

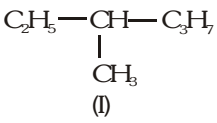
(II)  , are studied

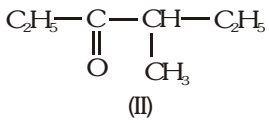
in terms of isomerism in-

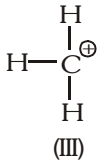
(1) chain isomerism (2) position isomerism

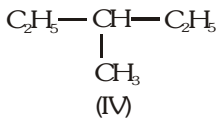
(3) conformers (4) stereo isomerism

4. Among the following four structures I to IV [AIEEE-2003]


(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

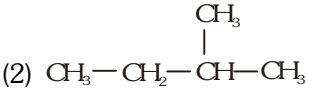
5. Which of the following will have a meso-isomer also- [AIEEE-2004]

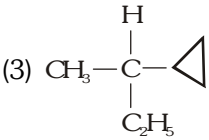
(1) 2–chlorobutane (2) 2,3–dichlorobutane

(3) 2,3–dichloropentene (4) 2–hydroxy propanoic acid

6. Amongst the following compounds, the optically active alkane having lowest molecular mass is

(1) $CH_3-CH_2-C\equiv CH$ [AIEEE-2004]

(2) 

(3) 

(4) $CH_3-CH_2-CH_2-CH_3$

7. Which of following compounds is not chiral [AIEEE-2005]

(1) 1–chloropentane

(2) 2–chloropentane

(3) 1–chloro–2–methyl pentane

(4) 3–chloro–2–methyl pentane

8. Of the five isomeric hexanes, the isomer which can give two monochlorinated compounds is-

(1) 2-methyl pentane [AIEEE-2005]

(2) 2,2–dimethyl butane

(3) 2,3–dimethyl butane

(4) n-hexane

9. Which types of isomerism is shown by 2,3–dichloro butane- [AIEEE-2005]

(1) structural (2) geometric

(3) optical (4) diastereo

10. Increasing order of stability among the three main conformations (i.e. Eclipse, Anti, Gauche) of 2-fluoroethanol is [AIEEE-2006]

(1) Gauche, Eclipse, Anti

(2) Eclipse, Anti, Gauche

(3) Anti, Gauche, Eclipse

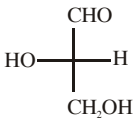
(4) Eclipse, Gauche, Anti

11. Which one of the following conformations of cyclohexane is chiral ? [AIEEE - 2007]

(1) Twist boat (2) Rigid

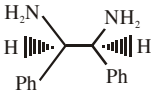
(3) Chair (4) Boat

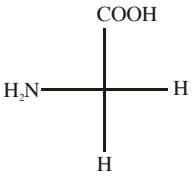
12. Which of the following molecules is expected to rotated the plane of plane-polarised light ?

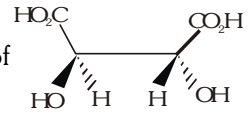
(1) 

(2) 

[AIEEE - 2007]

(3) 

(4) 

13. The absolute configuration of 

is [AIEEE - 2008]

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

14. $\alpha-D-(+)-$glucose and $\beta-D-(+)-$glucose are [AIEEE - 2008]

(1) conformers (2) epimers

(3) anomers (4) enantiomers

15. The alkene that exhibits geometrical isomerism is :- [AIEEE - 2009]

(1) 2–butene (2) 2–methyl–2–butene

(3) Propene (4) 2–methyl propene

16. The number of stereoisomers possible for a compound of the molecular formula CH_3–CH = CH–CH(OH)–Me is :- [AIEEE - 2009]

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

17. Out of the following, the alkene that exhibits optical isomerism is :- [AIEEE-2010]

(1) 2-methyl-2-pentene (2) 3-methyl-2-pentene

(3) 4-methyl-1-pentene (4) 3-methyl-1-pentene

18. Identify the compound that exhibits tautomerism :- [AIEEE-2011]

(1) 2-Pentanone (2) Phenol

(3) 2-Butene (4) Lactic acid

19. How many chiral compounds are possible on monochlorination of 2–methyl butane ? [AIEEE-2012]

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

20. Which branched chain isomer of the hydrocarbon with molecular mass 72 u gives only one isomer of mono substituted alkyl halide ? [AIEEE-2012]

(1) Neohexane (2) Tertiary butyl chloride

(3) Neopentane (4) Isohexane

21. How many cyclic structures are possible for C_4H_6 :- [AIEEE-2012(Online)]

(1) 3 (2) 5 (3) 4 (4) 6

22. Maleic acid and fumaric acids are :- [AIEEE-2012(Online)]

(1) Tautomers (2) Chain isomers

(3) Geometrical isomers (4) Functional isomers

PREVIOUS YEAR QUESTIONS ANSWER KEY EXERCISE-5(A)

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

MCQ's WITH ONE CORRECT ANSWER

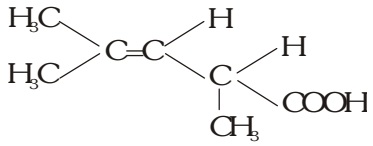
1. The enolic form of acetone contains : [IIT-90]
(A) 9σ bonds, 1π bond and 2 lone pairs (B) 8σ bonds, 2π bonds and 2 lone pairs
(C) 10σ bonds, 1π bonds and 1 lone pair (D) 9σ bonds, 2π bond and 1 lone pair

2. An organic molecule necessarity shows optical activitiy if it : [IIT-93]
(A) Contains asymmetric carbon atoms (B) is non polar
(C) is non superimposable on its mirror image (D) is superimposable on its mirror image

3. The compound which is not isomeric with diethyl ether is : [IIT-93]
(A) butan–1–ol (B) butanone
(C) 2–methyl propan–2–ol (D) n–propyl methyl ether

4. Ordinary light can be converted into plane polarized light with the help of a : [IIT-93]
(A) Nickel prism (B) Nicol prism (C) Diffraction grating (D) Quartz cell

5. The structure shows : [IIT-95]

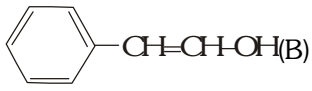
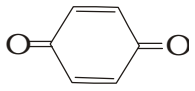
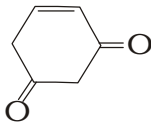
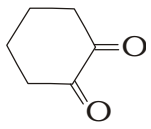


(A) Geometrical isomerism (B) Optical isomerism
(C) Geometrical & optical isomerism (D) tautomerism

6. How many optically active stereoisomers are possible for butane –2,3–diol : [IIT-97]
(A) 1 (B) 2 (C) 3 (D) 4

7. Isomers which can be interconverted through rotation around of single bond are - [IIT-97]
(A) Conformers (B) Diastereomers (C) Enantiomers (D) Positional isomers

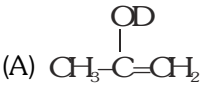
8. The number of possible enantiomeric pairs that can be produced during monochlorination of 2–methyl butane is : [IIT-97]
(A) 2 (B) 3 (C) 4 (D) 1

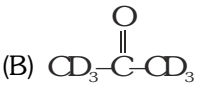
9. Tautomerism is not exhibited by : [IIT-98]
(A)  (B)  (C)  (D) 

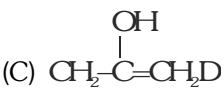
10. Rotation of polarised light can be measured by : [IIT-98]
(A) Monometer (B) Galvanometer (C) Polarimeter (D) Viscometer

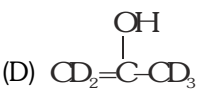
11. The optically active tartaric acid is named as D–(+) tartaric acid because it has a positive : [IIT-99]
(A) optical rotation and is derived from D–glucose
(B) pH in an organic solvent
(C) optical rotation and is derived from D–(+)– glyceraldehyde
(D) optical rotation only when substituted by deuterium

12. The enol form of acetone, after treatment with D_2O gives [IIT-99]

(A) 

(B) 

(C) 

(D) 

13. Which of the following compound will exhibits geometrical isomerism : [IIT-2000]

(A) 1–phenyl–2–butene (B) 3–phenyl–1–butene

(C) 2–phenyl–1–butene (D) 1, 1–diphenyl–1–propene

14. The number of isomers for the compound with molecular formula $C_2BrClFI$ is : [IIT-2000]

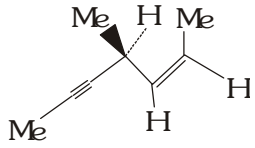
(A) 3 (B) 4 (C) 5 (D) 6

15. Which of the following exhibits stereoisomerism– [IIT-2000]

(A) 2–Methylbutene–1 (B) 3–Methylbutyne–1

(C) 3–Methylbutanoic acid (D) 2–Methylbutanoic acid

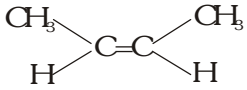
16. Hydrogen of the following compound in the presence of poisoned palladium catalyst gives : [IIT-2002]



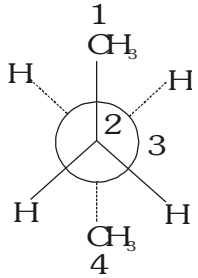
(A) optically active compound (B) an optically inactive compound

(C) a racemic mixture (D) a diastereomeric mixture

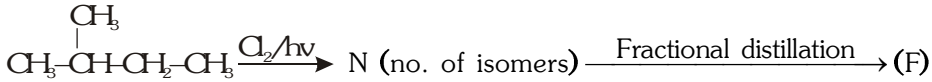
17. Which of the following has the lowest dipole moment : [IIT-2002]

(A)  (B) $CH_3–C\equiv C–CH_3$ (C) $CH_3CH_2C\equiv CH$ (D) $CH_2=CH–C\equiv CH$

18. If C_2 in below compound is rotated by 120° angle in anticlockwise direction along $C_2–C_3$, which of the following form will be produced : [IIT-2004]



(A) Partial eclipsed (B) Perfectly eclipsed (C) Perfectly staggered (D) Gauche conformation

19. 

, (N) and (F) are : [IIT-2006]

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

20. The number of structural isomers of C_6H_{14} is : **[IIT-2007]**

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

21. The number of stereoisomers obtained by bromination of trans–2–butene is : **[IIT-2007]**

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

22. **Statement-I :** Molecules that are not superimposable on their mirror images are chiral

Because

Statement-II : All chiral molecules have chiral centres. **[IIT-2007]**

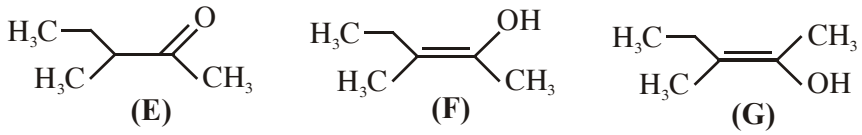
(A) Statement-1 is True, Statement-2 is True ; Statement-2 is a correct explanation for Statement-1

(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.

23. The correct statement(s) concerning the structures E, F and G is (are) **[IIT-2008]**



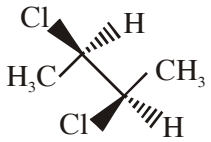
(A) **E, F** and **G** are resonance structures

(B) **E, F** and **E, G** are tautomers

(C) **F** and **G** are geometrical isomers

(D) **F** and **G** are diastereomers

24. The correct statement(s) about the compound given below is (are) :- **[IIT-2008]**



(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

25. The correct statement(s) about the compound $H_3C(HO)HC - CH = CH - CH(OH)CH_3$ **(X)** is (are) :

(A) The total number of stereoisomers possible for X is 6 **[IIT-2009]**

(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

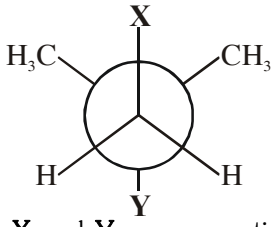
(D) If the stereochemistry about the double bond in X is cis, the number of enantiomers possible for X is 2

26. The bond energy (in kcal mol^{-1}) of a C–C single bond is approximately : **[IIT-2010]**

(A) 1 (B) 10

(C) 100 (D) 1000

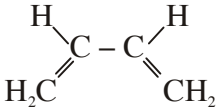
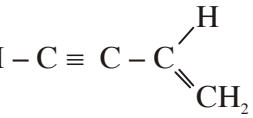
27. In the Newman projection for 2,2–dimethylbutane **[IIT-2010]**



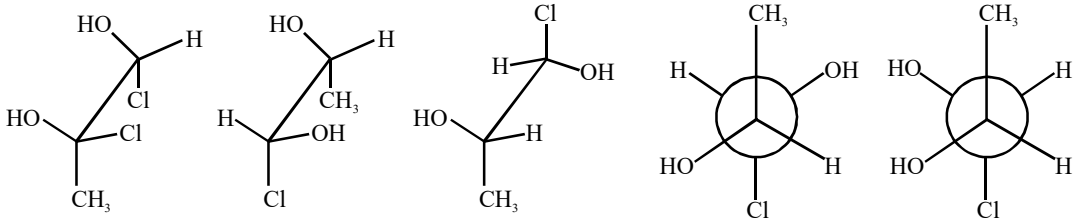
X and **Y** can respectively be –

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

28. Amongst the given option, the compound(s) in which all the atoms are in one plane in all the possible conformations (if any), is (are) - **[IIT-2011]**

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

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

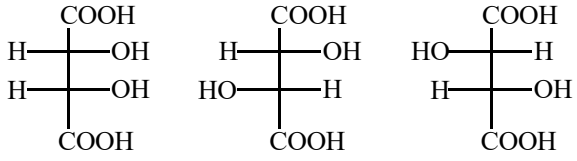


(A) M and N are non-mirror image stereoisomers (B) M and O are identical

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

P & Q are isomers of dicarboxylic acid $C_4H_4O_4$. Both decolorize Br_2/H_2O, On heating P forms the cyclic anhydride.

Upon treatment with dilute alkaline $KMnO_4$, P as well as Q could produce one or more than one from S, T and U. **[JEE ADVANCED-2013]**



30. Compounds formed from P and Q are respectively

(A) Optically active S and optically active pair (T, U)

(B) Optically inactive S and optically inactive pair (T, U)

(C) Optically active pair (T, U) and optically active S

(D) Optically inactive pair (T, U) and optically inactive S

PREVIOUS YEARS QUESTIONS			ANSWER KEY				EXERCISE -5(B)
1. (A)	**2.** (C)	**3.** (B)	**4.**(B)	**5.** (B)	**6.** (B)	**7.**(A)	**8.** (A)
9. (B)	**10.** (C)	**11.** (C)	**12.** (A)	**13.**(A)	**14.** (D)	**15.**(D)	**16.** (B)
17. (B)	**18.** (D)	**19.** (B)	**20.** (C)	**21.** (A)	**22.** (C)		**23.** (B, C, D)
24. (A, D)	**25.** (A, D)	**26.** (C)	**27.** (B, D)	**28.** (B, C)	**29.** (A, B, C)		**30.** (B)