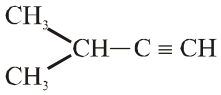
SOLVED EXAMPLES

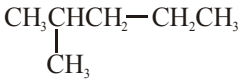
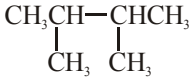
Ex. 1 The possible number of alkynes with the formula C_5H_8 is -

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

Sol. $CH_3CH_2CH_2C\equiv CH$  $CH_3CH_2C\equiv CCH_3$ Ans.**(B)**

Ex. 2 How many chain isomers can be obtained form the alkane C_6H_{14} is -

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

Sol. $CH_3CH_2CH_2CH_2CH_2CH_3$   Ans.**(B)**

(i) **(ii)** **(iii)**

Ex. 3 An alkane can show structural isomerism if it has ..... number of minimum carbon atoms –

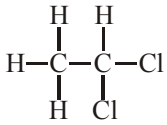
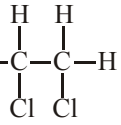
(A) 1 **(B)** 2 **(C)** 3 **(D)** 4

Sol. CH_4, CH_3-CH_3, $CH_3-CH_2-CH_3$ exist only in one structural form, while $CH_3CH_2CH_2CH_3$ can exist in more than one structure form. Ans.**(D)**

Ex. 4 The molecular formula of a saturated compound is $C_2H_4Cl_2$. The formula permits the existence of two

(A) functional isomers **(B)** Position isomers

(C) Optical isomers **(D)** cis-trans isomers

Sol. **(i)**  1,1-dichloro ethane **(ii)**  1,2-dichloro ethane Ans.**(B)**

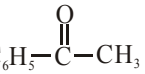
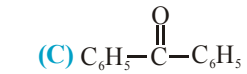
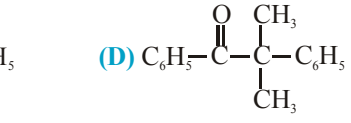
Both are position isomers

Ex. 5 Evaporation of an aqueous solution of ammonium cyanate gives urea. This reaction follows the class of -

(A) Polymerization **(B)** Isomerization **(C)** Association **(D)** Dissociation

Sol. $NH_4CNO \xrightarrow{heat} H_2N–CO–NH_2$ Ans.**(B)**

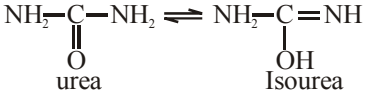
Ex. 6 Keto-enol tautomerism is observed in -

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

Sol. Only compound **(B)** contains α hydrogen atom for showing keto enol tautomerism. Ans.**(B)**

Ex. 7 The type of isomerism found in urea molecule is -

(A) Chain **(B)** Position **(C)** Tautomerism **(D)** None of these

Sol.  Ans.**(C)**

urea Isourea

Ex. 8 How many isomers of $C_5H_{11}OH$ will be primary alcohols -

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

Sol. $CH_3CH_2CH_2CH_2CH_2OH$ $CH_3CHCH_2CH_2OH$ (CH$_3$ branch) Ans.**(C)**

(i) **(ii)**

$HOCH_2-CHCH_2CH_3$ (CH$_3$ branch) $CH_3-C(CH_3)(CH_2OH)-CH_3$

(iii) **(iv)**

Ex. 9 Which of the following is an isomer of diethyl ether -

(A) $(CH_3)_3COH$ **(B)** CH_3CHO

(C) C_3H_7OH **(D)** $(C_2H_5)_2CHOH$

Sol. Diethyl ether has 4 carbon atoms, among different alternative alcohols only $(CH_3)_3COH$ has 4 carbon atoms. Ans.**(A)**

Ex. 10 Number of isomeric forms of C_7H_9N having benzene ring will be -

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

Sol. CH_2NH_2 CH_3, NH_2 $NHCH_3$ Ans.**(C)**

(i) o-, m-, p- (ii)(iii)(iv) (v)

Ex. 11 Total number of isomeric alcohols with formula $C_4H_{10}O$ are -

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

Sol. **(i)** $CH_3CH_2CH_2CH_2OH$ **(ii)** $CH_3CH_2-CH(OH)-CH_3$ **(iii)** $CH_3-CH(CH_3)-CH_2OH$ **(iv)** $CH_3-C(OH)(CH_3)-CH_3$ Ans.**(D)**

Ex. 12 The number of geometrical isomers in case of a compound with the structure :

$CH_3-CH=CH-CH=CH-C_2H_5$ is -

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

Sol. Given alkene is unsymmetrical one and has two double bonds, the number of geometrical isomers is given by 2^n. ($n = 2$) therefore number of geometrical isomers will be $2^2 = 4$ Ans.**(A)**

Ex. 13 Which one of the following will show geometrical isomerism -

(A) CH_2Cl, H, CH_3, $CH=C(CH_3)_2$ **(B)** CH_3, CH_2Cl, H, $CH=C(CH_3)_2$

(C) $CH_2=CH$, H, CH_2Cl, $CH=CH_2$ **(D)** $CH_3CH_2CH=CHCH_2CH_3$ Ans.**(D)**

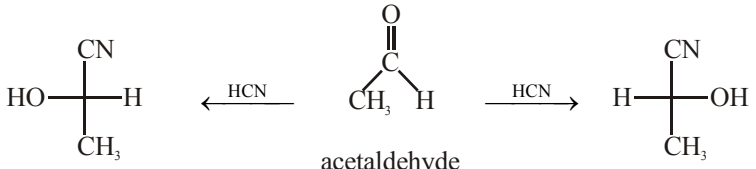
Ex. 14 In the reaction

$CH_3CHO + HCN \longrightarrow CH_3CH(OH)CN$

a chiral centre is produced. Thus product would be -

(A) Meso compound **(B)** Racemic mixture **(C)** Laevorotatroy **(D)** Dextrorotatory

Sol. Synthesis of a chiral compound from a chiral compound in the absence of optically active agent always produces racemic modification :



- lactonitrile acetaldehyde d - lactonitrile

Ans.**(B)**

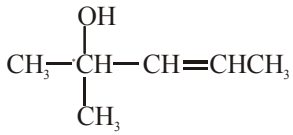
Ex. 15 The molecule 3-penten-2-ol can exhibit -

(A) Optical isomerism **(B)** Geometrical isomerism **(C)** Metamerism **(D)** Tautomerism

The correct answer is -

(A) a and b **(B)** a and c **(C)** b and c **(D)** a and c

Sol.



3-penten-2-ol

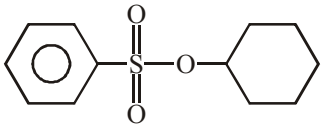
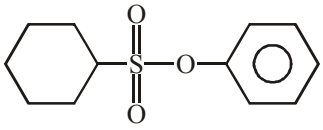
Ans.**(A)**

As given compound contains a assymmetric carbon atom and a double bond (with sufficient conditions for geometrical isomerism). Therefore it can shown both optical and geometrical isomerism.

Exercise # 1 [Single Correct Choice Type Questions]

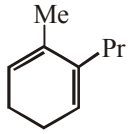
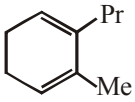
1. The number of primary, secondary and tertiary amines possible with the molecular formula C_3H_9N respectively.
(A) 1, 2, 2 **(B)** 1, 2, 1 **(C)** 2, 1, 1 **(D)** 3, 0, 1

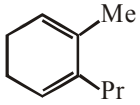
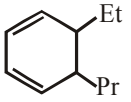
2. Given compound shows which type of isomerism

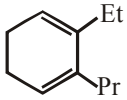
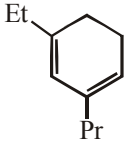

and


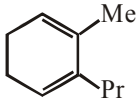
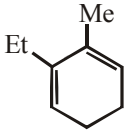
(A) Chain isomerism **(B)** Positional isomerism
(C) Metamerism **(D)** Functional group isomerism

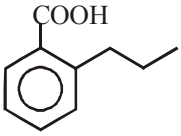
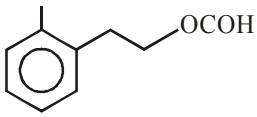
3. Which of the following has incorrect relation

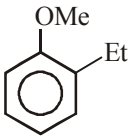
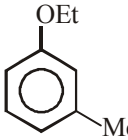
(A)  &  identical

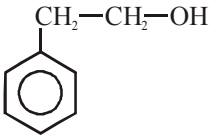
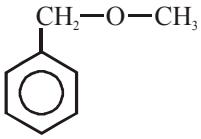
(B)  &  positional isomers

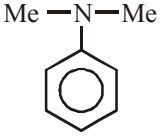
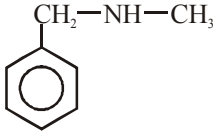
(C)  &  positional isomers

(D)  &  homologues

4.  &  functional isomer

 &  metamers

 &  metamers

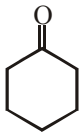
 &  functional isomers

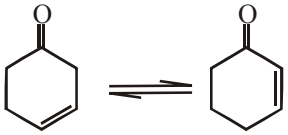
(A) TFTF **(B)** FTTF **(C)** TTFT **(D)** TFFT

5. How many structural isomers of C_5H_{10} are possible.

(A) 10 **(B)** 11 **(C)** 12 **(D)** 13

6. Tautomer in following is Diad system :

(A) CH_3COCH_3 **(B)** $CH_3CH_2NO_2$ **(C)**  **(D)** HCN

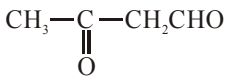
7. 

Above interconversion takes place in

(A) Acidic medium **(B)** Basic medium **(C)** Both **(D)** None

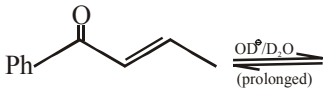
8. Among the following the compounds having the highest enol content :

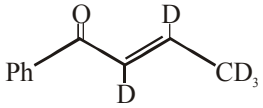
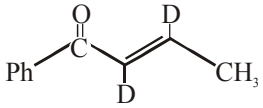
(A) CH_3CHO **(B)** CH_3COCH_3

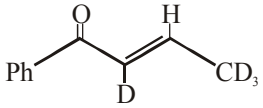
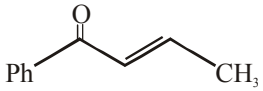
(C)  **(D)** $CH_3-CO-CH_2-CO_2CH_3$

9. How many structural isomer are possible when one of the hydrogen is replaced by a chlorine atom in anthracene?

(A) 3 **(B)** 7 **(C)** 4 **(D)** 6

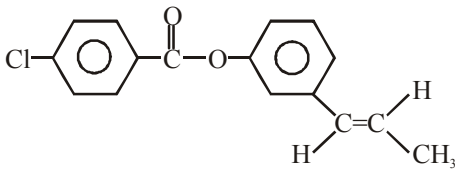
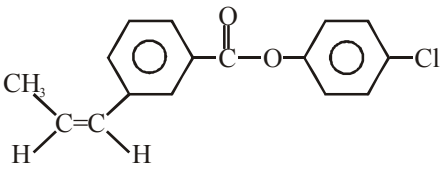
10.  (P) final product is ?

(A)  **(B)** 

(C)  **(D)** 

11. How many minimum no. of C-atoms are required for position & geometrical isomerism in alkene?

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

12.  and 

Shows which type of isomerism

(A) Functional group isomerism **(B)** Geometrical isomerism

(C) Metamerism **(D)** Position isomerism

13. Which of the following cannot be written in an isomeric form?

(A) $CH_3-CH(OH)-CH_2-CH_3$ **(B)** CH_3-CHO

(C) $CH_2=CH-Cl$ **(D)** $Cl-CH_2CH_2-Cl$

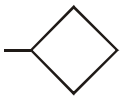
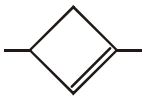
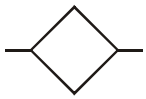
14. Geometrical isomerism is possbile in :

(A) isobutene **(B)** acetone oxime **(C)** acetophenone oxime **(D)** benzophenone oxime

15. Which of the following does not show geometrical isomerism?

(A) 1,2-dichloro-1-pentene **(B)** 1,3-dichloro-2-pentene
(C) 1,1-dichloro-1-pentene **(D)** 1,4-dichloro-2-pentene

16. Which of the following will show geometrical isomerism.

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

17. The number of optically active isomers observed in 2,3-dichlorobutane is :

(A) 0 **(B)** 2 **(C)** 3 **(D)** 4

18. How many stereoisomers of the following molecule are possible?

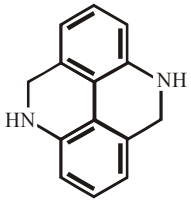
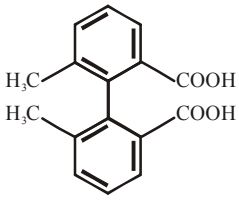
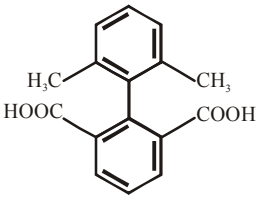
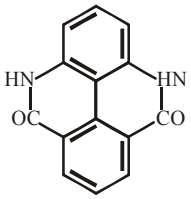
HOOC.CH=C=CH.COOH

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

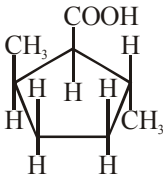
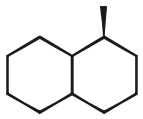
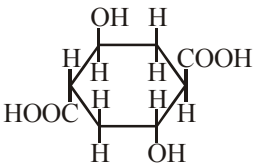
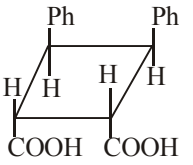
19. The total number of isomeric optically active monochloro derivative of isopentane is :

(A) two **(B)** three **(C)** four **(D)** one

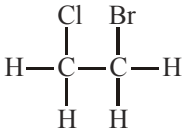
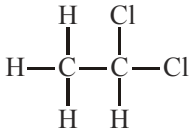
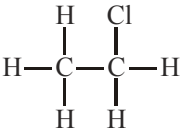
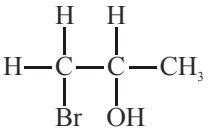
20. Select the optically active compound among the folloiwng :

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

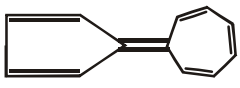
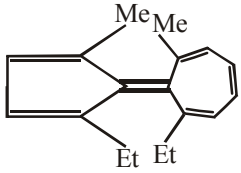
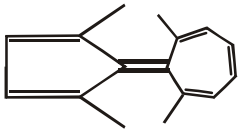
21. Which species exhibits a plane of symmetry?

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

22. Which of the following have asymmetric carbon atom?

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

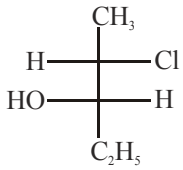
23. Select resolvable compound :

(A)  **(B)**  **(C)**  **(D)** none of these

24. Meso-tartaric acid and d-tartaric acid are

(A) positional isomers **(B)** enantiomers **(C)** diastereomers **(D)** racemic mixture

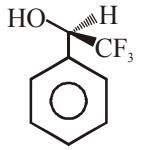
25.



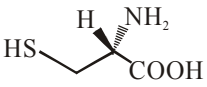
The compound with the above configuration is called :

(A) (2S, 3S)-2-chloro-3-pentanol **(B)** (2S, 3R)-2-chloro-3-pentanol
(C) (2R, 3R)-2-chloro-3-pentanol **(D)** (2R, 3S)-2-chloro-3-pentanol

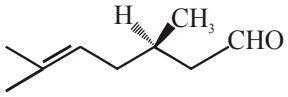
26. The R/S configuration of these compounds are respectively.



(A) R,R,R

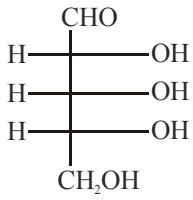


(B) R,S,R



(C) R,S,S **(D)** S,S,S

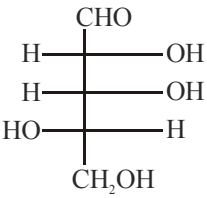
27.



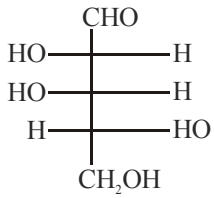
(D-ribose)

L-form of the given compounds is :

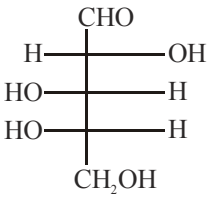
(A)



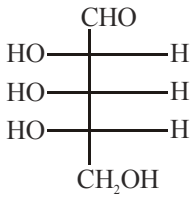
(B)



(C)

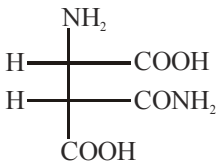


(D)



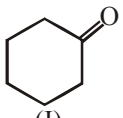
28. Select the correct IUPAC name of following compound :

(A) 2R, 3S-3-amino-2-carbamoyl butane-1,4-dioic acid
(B) 2S, 3R-2-amino-3-carbamoyl butane-1,4-dioic acid
(C) 2S, 3R-3-amino-2-carbamoyl butane-1,4-dioic acid
(D) 2R, 3R-2-amino-3-carbamoyl butane-1,4-dioic acid

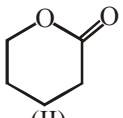


29. In each of the folloiwng sets of compounds write the decreasing order of % enol content.

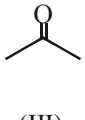
(A)



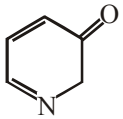
(I)



(II)



(III)



(IV)

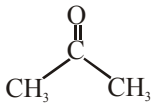
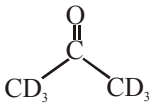
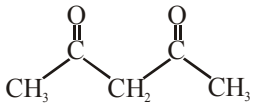
(A) 4 > 1 > 3 > 2 **(B)** 4 < 1 >3 > 2 **(C)** 4 > 1 < 3 > 2 **(D)** 4 < 1 < 3 < 2

30. How many cyclopentane structures (excluding stereo isomer) are possible for C_7H_{14}.

(A) 8 **(B)** 4 **(C)** 10 **(D)** 3

31. Calculate the total number of structural isomers of 3°-amines for the molecular formula $C_6H_{15}N$ are?

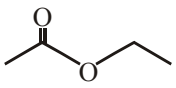
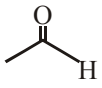
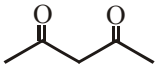
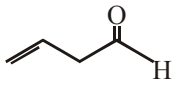
(A) 8 **(B)** 7 **(C)** 10 **(D)** 3

32.  (I)  (II)  (III)

Among these give case of enolization.

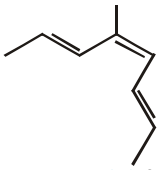
(A) 3 > 1 >2 **(B)** 3 < 1 < 2 **(C)** 3 > 1 < 2 **(D)** 3 = 1 > 2

33. In each of the following sets of compounds write the decreasing order of % enol content.

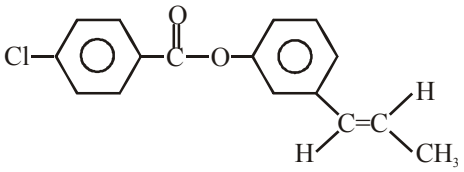
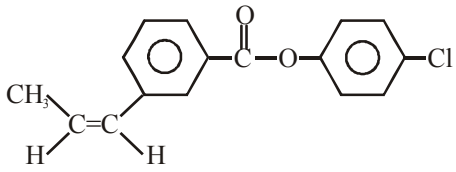
 (I)  (II)  (III)  (IV)

(A) 3 < 4 < 2 < 1` **(B)** 3 < 4 >2 > 1 **(C)** 3 > 4 > 2 > 1 **(D)** 3 > 4 > 2 < 1

34. What is the correct IUPAC name of the following compound



(A) 2E, 4E, 6Z 4-methyl oct-2,4,6 triene **(B)** 2E, 4Z, 6Z 5-methyl oct-2, 4, 6 triene
(C) 2Z, 4Z, 6Z 5-methyl oct-2, 4, 6 triene **(D)** 2E, 4Z, 6E 4-methyl oct-2, 4, 6 triene

35.  and 

Shows which type of isomerism
(A) Functional group isomerism **(B)** Geometrical isomerism
(C) Metamerism **(D)** Position isomerism

36. The IUPAC name of the given compound is

(A) 2,4-di-[(E)-ethylidene] cyclobutane **(B)** 1,3-di-[(E)-ethylidene] cyclobutane
(C) 1,4-di-[(E)-ethylidene] cyclobutane **(D)** (E)-1, 4-ethylidenecyclobutane

37. Which of the following does not show geometrical isomerism?
(A) 1,2-dicholoro-1-pentene **(B)** 1,3-dicholoro-2-pentene
(C) 1,1-dicholoro-1-pentene **(D)** 1,4-dicholoro-2-pentene

38. What characteristic is the best common to both cis-2-butene and trans-2-butane?
(A) B.P. **(B)** Dipole moment **(C)** heat of hydrogenation **(D)** Product of hydrogenation

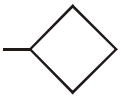
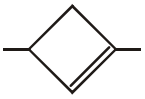
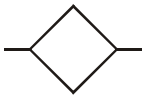
39. The IUPAC name of the compound :

(A) (2E, 4E, 6Z)-octa-2,4,6-triene **(B)** (2E, 4E, 6E)-octa-2,4,6-triene
(C) (2Z, 4E, 6Z)-octa-2,4,6-triene **(D)** (2Z, 4Z, 6Z)-octa-2,4,6-triene

40. Geometrical isomerism is possible in :

(A) isobutene **(B)** acetone oxime **(C)** acetophenone oxime **(D)** benzophenone oxime

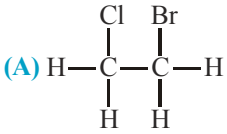
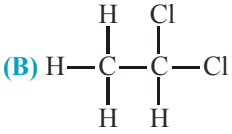
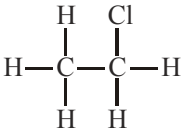
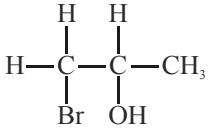
41. Which of the following will show geometrical isomerism.

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

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

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

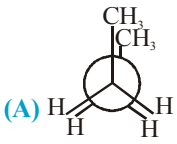
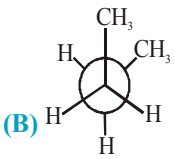
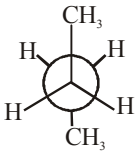
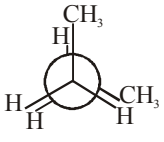
43. Which of the following have asymmetric carbon atom?

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

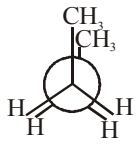
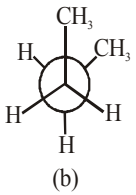
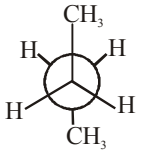
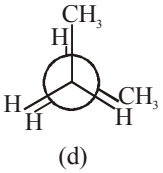
44. The number of optically active isomers observed in 2,3-dichlorobutane is :

(A) 0 **(B)** 2 **(C)** 3 **(D)** 4

45. Which form is more stable among all these arrangements

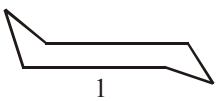
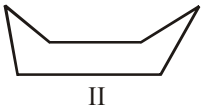
(A)  (a) **(B)**  (b) **(C)**  (c) **(D)**  (d)

46. Correct order of stability among the following -

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

(A) c > b > d > a **(B)** c < b > d < a **(C)** c < b > d > a **(D)** c > d = d > a

47. Which form is more stable in the shown case -

 1 and  II

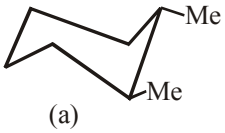
(A) I **(B)** II **(C)** I = II **(D)** II > I

48. Increasing order of stability among the three main conformation (i.e. eclipse, anti, gauche) of ethylene glycol is :

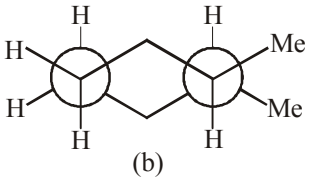
(A) Eclipse, gauche, anti **(B)** Gauche, eclipse, anti

(C) Eclipse, anti, gauche **(D)** Anti, gauche, eclipse

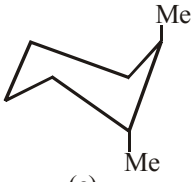
49. The correct stability order of the following species is



(a)



(b)



(c)

(A) c < a < b **(B)** c = b < a **(C)** c < a = b **(D)** a = b = c

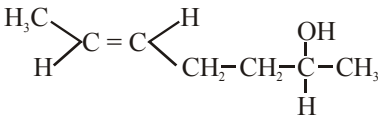
50. The number of primary alcohols possible with the formula $C_4H_{10}O$ is -

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

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

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

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



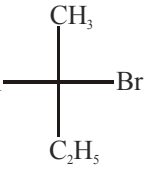
The value of x and y respectively are -

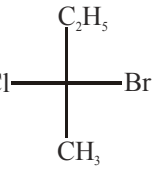
(A) 4 and 4 **(B)** 2 and 2 **(C)** 2 and 4 **(D)** 4 and 2

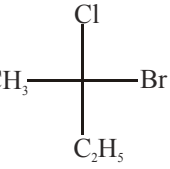
53. The total number of benzene derivatives with the molecular formula $C_6H_3Cl_3$ is -

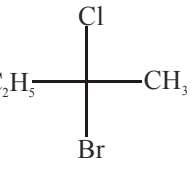
(A) 2 **(B)** 3 **(C)** 4 **(D)** 5

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

(A)


(B)


(C)


(D)


Which of the following statements is not correct

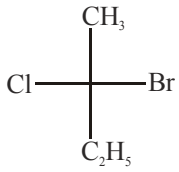
(A) B and C are identical

(B) A and B are enantiomers

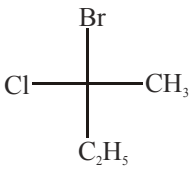
(C) A and C are enantiomers

(D) B and D are enantiomers

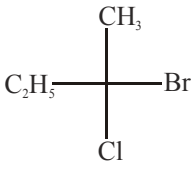
55. The interchange of two group (Br and CH_3) at the chiral centre of the projection formula **(A)** yields the formula **(B)**, while the interchange of another set of two groups (C_2H_5 and Cl) of **(A)** yields the projection formula **(C)** -



(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

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

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

57. 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

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

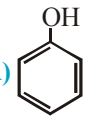
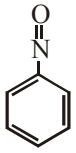
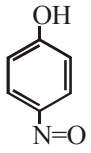
(A) + 118.5° **(B)** –118.5° **(C)** –79° **(D)** + 79°

59. When $C_6H_4Cl_2$ is converted into $C_6H_3Cl_3$, o-isomers 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 :

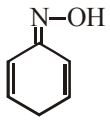
(A) 1, 2, 3 **(B)** 2, 1, 3 **(C)** 1, 3, 2 **(D)** 2, 3, 1

Exercise # 2 Part # I [Multiple Correct Choice Type Questions]

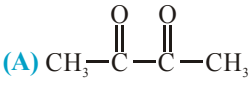
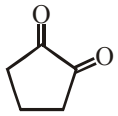
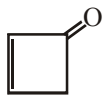
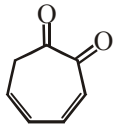
1. Which compound show tautomerism.

(A)  **(B)**  **(C)**  **(D)** None of these

2. Which compound show tautomerism

(A) Ph–NO **(B)**  **(C)**  **(D)** HCHO

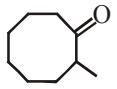
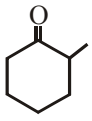
3. Which of the following compounds have higher enolic content than Keto content :

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

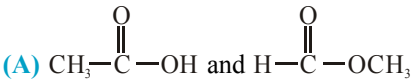
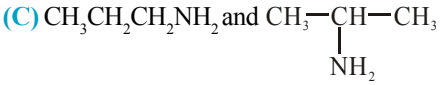
4. Enolic form of acetyl acetone is stablised due to :

(A) resonance as a result of conjugation **(B)** intramolecular hydrogen bonding
(C) vander waals force **(D)** dipole -dipole repulsion

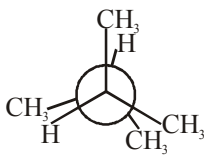
5. Tautomer of which of the following can show geometrical isomerism

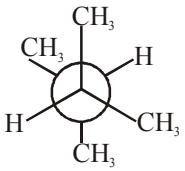
(A) CH_3-CHO **(B)** CH_3CH_2-CHO **(C)**  **(D)** 

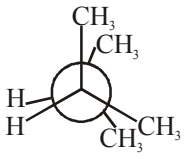
6. Which of the following is/are correct matchings?

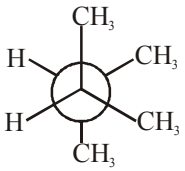
(A)  – Metamers
(B) $CH_3-CH_2-C\equiv CH$ and $CH_3-C\equiv C-CH_3$ – Position isomers
(C)  – Tautomers
(D) CH_3CH_2OH and $(CH_3)_2O$ – Functional isomer

7. In which of the following has minimum torsional strain and minimum Vander waal strain.


I


II

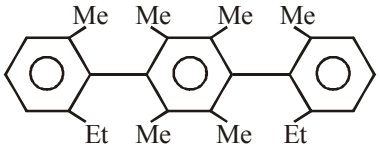

III

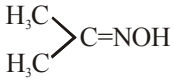

IV

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

8. Which will show geometrical isomerism?

(A) $CH_3CH=NOH$

(B) 

(C) 

(D) $HO-N=N-OH$

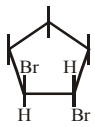
9. The IUPAC name of the compound :

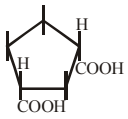
(A) (2E, 4E, 6Z)-octa-2,4,6-triene
(B) (2E, 4E, 6E)-octa-2,4,6-triene
(C) (2Z, 4E, 6Z)-octa-2,4,6-triene
(D) (2Z, 4Z, 6Z)-octa-2,4,6-triene

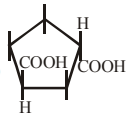
10. The isomerism observed in alkanes is :
(A) metamersim **(B)** Chain isomerism **(C)** position isomerism **(D)** geometrical isomerism

11. Which out the following are Non-resolvable.

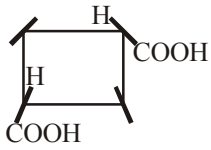
(A) 

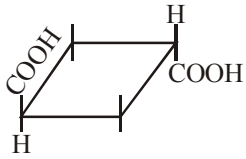
(B) 

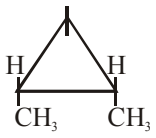
(C) 

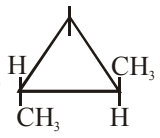
(D) 

12. Which out of the following are resolvable.

(A) 

(B) 

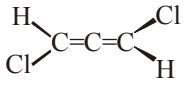
(C) 

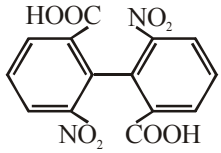
(D) 

13. Which of the following compounds are optically active?

(A) $CH_3.CHOH.CH_2.CH_3$

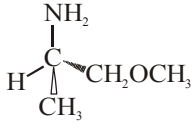
(B) $H_2C=CH.CH_2.CH=CH_2$

(C) 

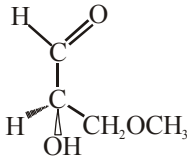
(D) 

14. Which conformation of n-Butane has both plane of symmetry and centre of symmetry absent?
(A) fully eclipsed **(B)** Gauche **(C)** Partially eclipsed **(D)** Anti

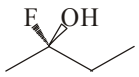
15. Consider the following structure and pick by the right statement:



I



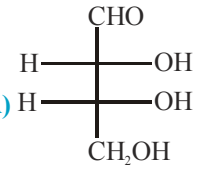
II

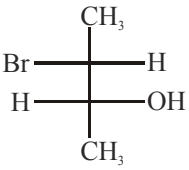


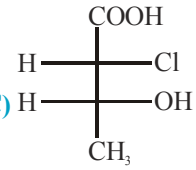
III

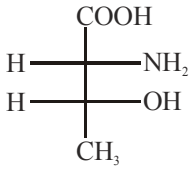
(A) I and II hgave R-configuration
(B) I and III have R-configuration
(C) only III has S-configuration
(D) I and III have S-configuration

16. Which of the following is a 'thereo' isomer?

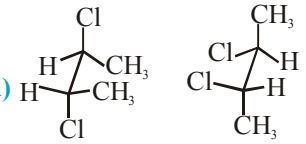
(A) 

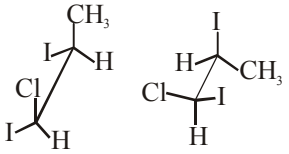
(B) 

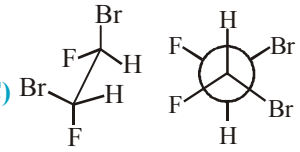
(C) 

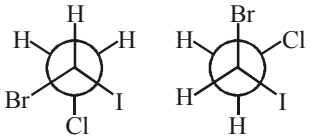
(D) 

17. Which of the following pairs of compound is/are identical ?

(A) 

(B) 

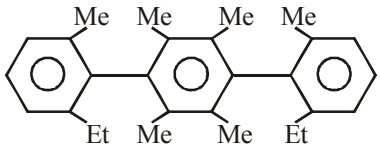
(C) 

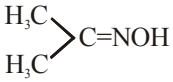
(D) 

18. Which of the following statements is/are not correct?
(A) Metamerism belongs to the category of structural isomerism
(B) Tautomeric structures are the resonating structures of a molecule
(C) Keto form is always more stable that the enol form
(D) Geometrical isomerism is shown only by alkenes

19. Which will show geometrical isomerism?

(A) $CH_3CH=NOH$

(B) 

(C) 

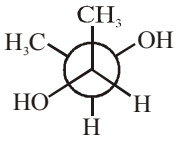
(D) $HO-N=N-OH$

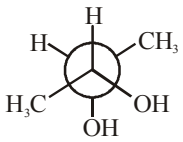
20. Which of the following statements are correct :
(A) Any chiral compound with a single asymmetric carbon must have a positive optical rotation if the compound has the R configuration
(B) If a structure has no plane of symmetry it is chiral
(C) All asymmetric carbons are stereocentres
(D) Alcohols and ether are functional isomers

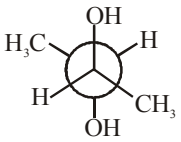
21. Which of the following statements for a meso compound is correct?
(A) The *meso* compound has either a plane or a centre of symmetry
(B) The *meso* compound is chiral.
(C) The *meso* compound is achiral
(D) The *meso* compound is formed when equal amounts of two enantiomers are mixed.

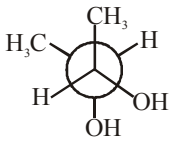
22. Which of the following statements is/are correct?
(A) A meso compound has chiral centres but exhibits no optical activity
(B) A meso compound has no chiral centres and thus are optically inactive.
(C) A meso compound has molecules which are super imposable on their mirror images even though they contain chiral centres
(D) A meso compound is optically inactive because the rotation caused by any molecule is cancelled by an equal and opposite rotation caused by another molecule that is the mirror image of the first.

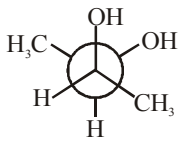
23. Which of the following molecules is/are identical with that represented by



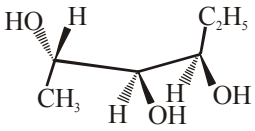
(A) 

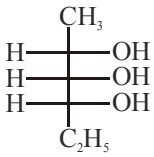
(B) 

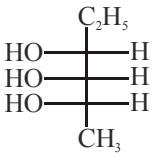
(C) 

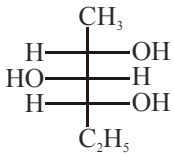
(D) 

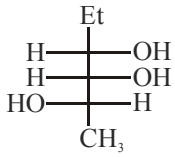
24. Which of the following is/are the correct Fischer projection of the following :



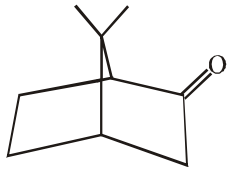
(A) 

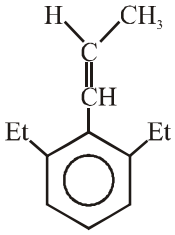
(B) 

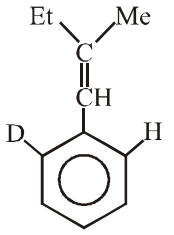
(C) 

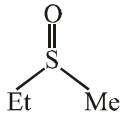
(D) 

25. Which of the following is/are resolvable :

(A) 

(B) 

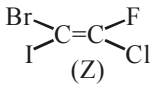
(C) 

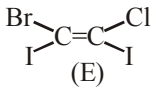
(D) 

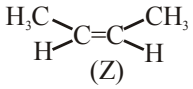
26. Which conformation of n-Butane has both plane of symmetry and centre of symmetry absent?

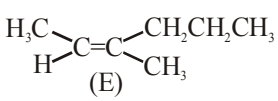
(A) fully eclipsed **(B)** Gauche **(C)** Partially eclipsed **(D)** Anti

27. Which of the following notations are correct :

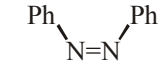
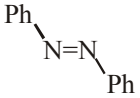
(A) 

(B) 

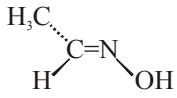
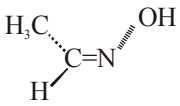
(C) 

(D) 

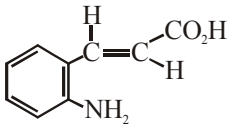
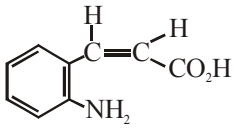
28. For which of the following pairs of compounds are the correct notation given : -

(A)  and 

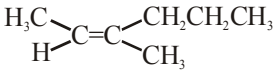
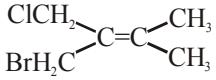
Anti-ezobenzene Syn-azobenzene

(B)  and 

Syn-acetaldoxime Anti-acetaldoxime

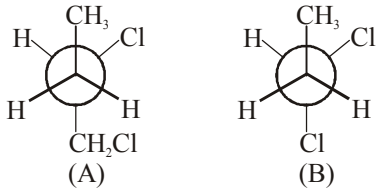
(C)  and 

Trans-o-aminocinnamic acid Cis-o-aminocinnamic acid

(D)  and 

Z-isomer E-isomer

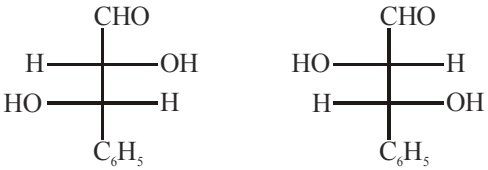
29. Observe the following structures and pick up the correct option (s) mentioned below :-



(A) (B)

(A) The two are position isomers
(B) None of the two shows optical isomers
(C) Only A shows optical isomerism
(D) The two are not related to each other regarding isomerism

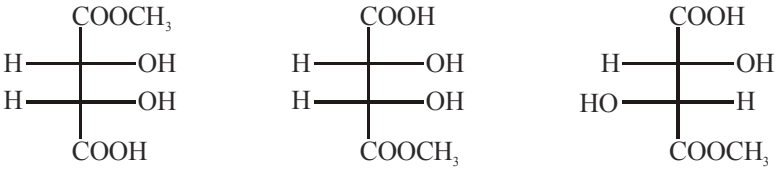
30. Which statement(s) is/are correct for : -



(I) (II)

(A) Both are in threo form
(B) Both are enantiomers
(C) Both are diastereomers
(D) Both are in erythro form

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

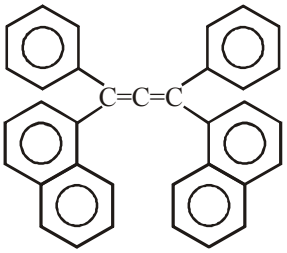


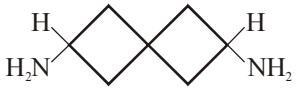
(a) (b) (c)

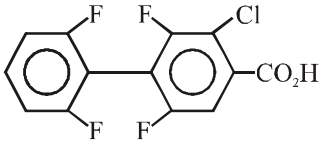
(A) A and B are diastereomers
(B) A and C are diastereomers
(C) B and C are diastereomers
(D) A and B are enantiomers

32. Which of the following are optically active : -

(A) $H_2C=C=CH_2$

(B) 

(C) 

(D) 

33. 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

34. 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

Part # II [Assertion & Reason Type Questions]

These questions consists of two statements each, printed as Statement-I and Statement-II. While answering these Questions you are required to choose any one of the following four responses.

(A) If both Statement-I & Statement-II are True & the Statement-II is a correct explanation of the Statement-I

(B) If both Statement-I & Statement-II are True but Statement-II is not a correct explanation of the Statement-I.

(C) If Statement-I is True but the Statement-II is False.

(D) If Statement-I is False but the Statement-II is True.

1. **Statement - I** : Cyclohex -2, 6-dien-1-one does not show tautamerism.

Statement - II : Carbonyl compounds with α-H shows tautamerism.

2. **Statement - I** : Staggered (anti) is always more stable than Gauche.

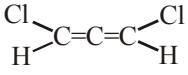
Statement - II : Because staggered form has minimum steric crowding.

3. **Statement - I** : $Me-C\equiv N$ and $Me-\vec{N}=C$ are not functional isomers.

Statement - II : As in HCN cyanide and isocyanide groups are interconvertible into each other and remains in equilibrium.

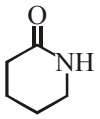
4. **Statement- I** : 5,5-dimethyl-1, 3-cyclohexanedione exists predominantly in its enol form, but 2,2-dimethyl-1,3-cyclohexanedione does not.

Statement- II: 2,2-dimethyl-1,3-cyclohexane dione has less α-hydrogen atoms than 5,5-dimethyl-1,3-cyclohexanedione.

5. **Statement - I** :  This compound will show geometrical isomerism.

Statement - II : Terminal carbon groups are perpendicular to each other.

6. **Statement - I** : E-cyclopentadecene is having more ΔH_c (Heat of combustion) than Z isomer.
Statement - II : E-cyclopentadecene is more stable than Z isomer.

7. **Statement - I** : Resonating structures of  can show geometrical isomerism at room temperature.

Statement - II : Lone pair of nitrogen will participate in resonance but only E form is stable in it's resonating. structure.

8. **Statement - I** : Staggered and eclipsed ethane can not be separated.
Statement - II : Energy barrier between staggered and eclipsed form of ethane is 12.6 kJ/mole.

9. **Statement - I** : All double bond containing compounds show geometrical isomerism.
Statement - II : Alkenes have restricted rotation about the double bond.

10. **Statement - I** : Meso-tartiaric acid is optically active.
Statement - II : Optically active molecule is a molecule that cannot be superimposed on its mirror image.

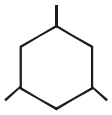
11. **Statement - I** : Cyclohexanone exhibits keto-enol tautomerism.
Statement - II : In cyclohexanone, one form contains the keto group (C=O) while other contains enolic group (–C = C – COH.).

12. **Statement - I** : Trans-isomers are more stable than cis-isomer.
Statement - II : The cis-isomer is the one in which two similar groups are on the same side of double bond.

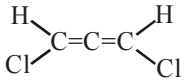
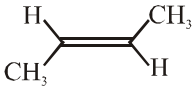
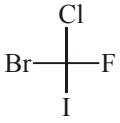
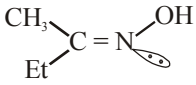
13. **Statement - I** : Propadiene is optically inactive.
Statement - II : Propadiene has a plane of symmetry.

Exercise # 3 Part # I [Matrix Match Type Questions]

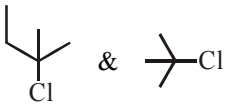
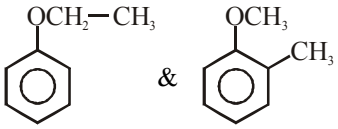
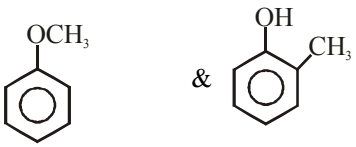
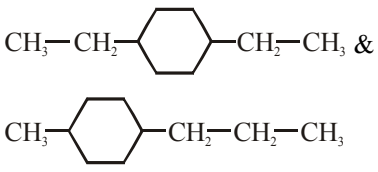
1. Match the column I with column II.

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

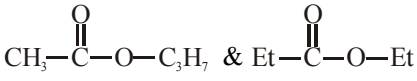
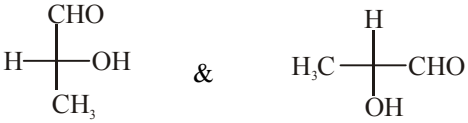
3. Match the column I with column II.

	Column - I (Molecule)		Column -I I (Property)
(A)		(p)	Homologs
(B)		(q)	Functional isomers
(C)		(r)	Metamer
(D)		(s)	Chain isomers

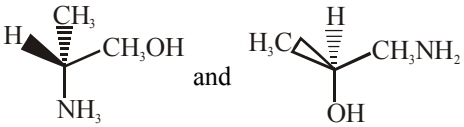
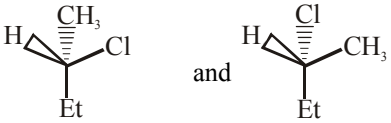
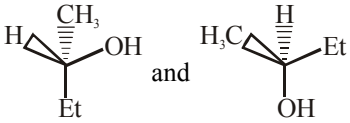
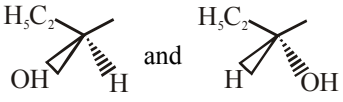
4. Match column - I with column - II :

	Column - I **Compound**		**Column -II** **Number of optically active isomer**
(A)	Unsymmetrical compound with 'n' chiral carbon	**(p)**	2^{n-1}
(B)	Symmetrical molecule with 'n' chiral carbon when n is even	**(q)**	$2^{n-1} - 2^{n-1/2}$
(C)	Symmetrical molecule with 'n' chiral carbon when n is odd	**(r)**	2^n

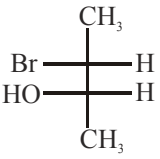
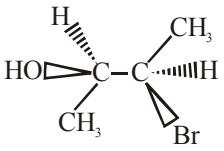
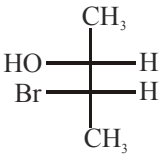
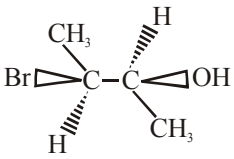
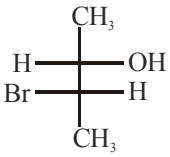
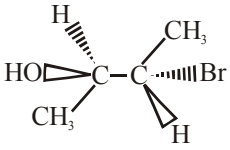
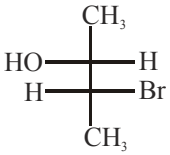
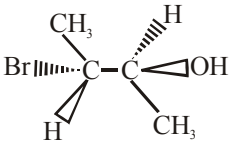
5. Match Column I with Column II :

	Column - I		**Column -II**
(A)		**(p)**	Enantiomer
(B)		**(q)**	Positional isomers
(C)		**(r)**	Metamers
(D)		**(s)**	Tautomers

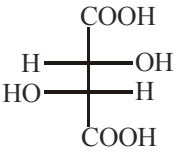
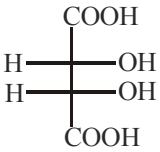
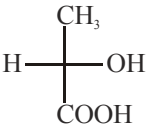
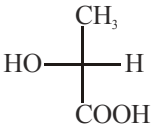
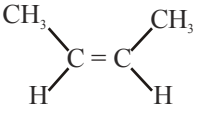
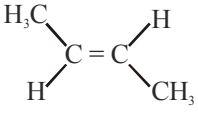
6. Match the column :

	Column - I		**Column -II**
(A)		**(p)**	Structural isomers
(B)		**(q)**	Identical
(C)		**(r)**	Enantiomers
(D)		**(s)**	Diastereomers

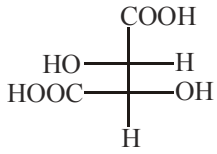
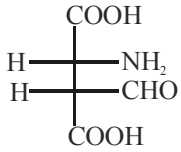
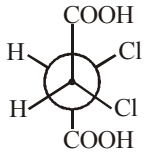
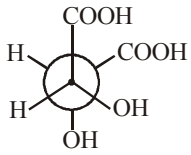
7. Match List - I, List - II & List - III :

List - I	List - II	List - III
(A) 	**(1)** 	**(i)** (2R, 3R)
(B) 	**(2)** 	**(ii)** (2S, 3S)
(C) 	**(3)** 	**(iii)** (2S, 3R)
(D) 	**(4)** 	**(iv)** (2R, 3S)

8. Match the column :

Column - I		Column - II		
(A)	A pair of metamer	**(i)** 	;	
(B)	tautomerism	**(ii)** $CH_3OC_3H_7$	;	$C_2H_5OC_2H_5$
(C)	A pair of geometrical isomer	**(iii)** 	;	
(D)	A pair of diastereomer	**(iv)** 	;	
(E)	A pair of optical isomer	**(v)** 	;	$CH_3CH_2CH=CH-OH$

9. Match the column :

Column - I		Column -I I	
(A)		**(p)**	Erythro
(B)		**(q)**	Threo
(C)		**(r)**	Meso
(D)			

Part # II [Comprehension Type 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

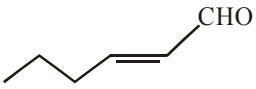
2. On treating with NH_2OH, which can form two products?

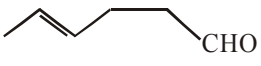
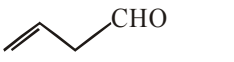
(A) Acetaldehyde **(B)** Acetone **(C)** Formaldehyde **(D)** Benzophenone

3. Number of stereoisomers of the compound 2-chloro-4-methylhex-2-ene is/are

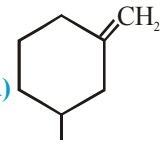
(A) 1 **(B)** 2 **(C)** 4 **(D)** 16

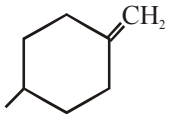
4. The correct structure of trans-2-hexenal is –

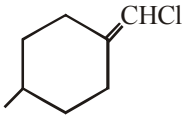
(A)  **(B)** 

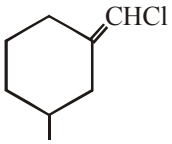
(C)  **(D)** 

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 molecules cannot be superimposed on its mirror image. These stereoisomers 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

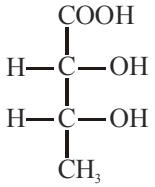
2. Which of the following compounds is not chiral ?

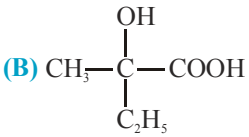
(A) $DCH_2CH_2CH_2Cl$ **(B)** CH_3CH_2CHDCl **(C)** CH_3CHDCH_2Cl **(D)** $CH_3CHClCH_2D$

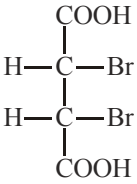
3. The total number of acyclic isomers including the stereoisomers (geometrical and optical) possible with the molecular formula C_4H_7Cl is :

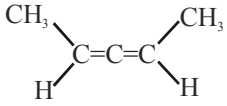
(A) 12 **(B)** 11 **(C)** 10 **(D)** 9

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-Chloropent-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

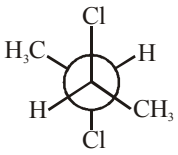
Comprehension # 3

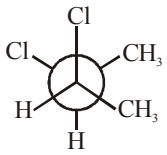
Different spatial arrangements of the atoms that result from rotation about a single bond are conformers. n-Butane has four conformers eclipsed, fully eclipsed, gauche and anti. The stability order of these conformers are as follows:

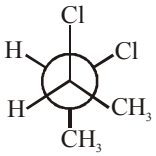
Anti > gauche > Partial eclipsed > Fully eclipsed

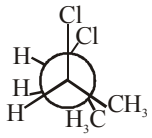
Although anti is more stable than gauche but in some cases gauche is more stable than anti.

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

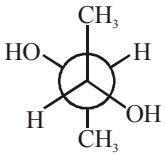
(A) 

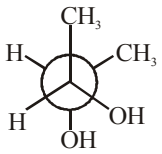
(B) 

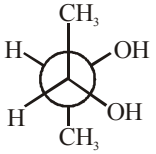
(C) 

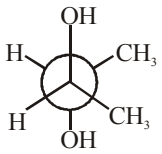
(D) 

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

(A) 

(B) 

(C) 

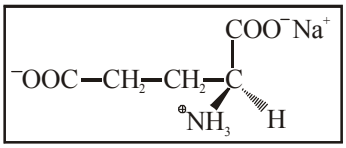
(D) 

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

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

Comprehension # 4

S(+) Mono Sodium Glutanate (MSG) is a flavour enhancer used in many foods. Fast foods often contain substantial amount of MSG and is widely used in Chinese food. If one mole of above MSG was placed in 845 ml solution and passed through 200 mm tube, the observed rotation was found to be +9.6°.



MSG

1. Find out the specific rotation of (–) MSG :

(A) +24° **(B)** +56.8° **(C)** –48° **(D)** None of these

2. Find out the approximate percentage composition of (–) MSG in a mixture containing (+) MSG and (–) MSG whose specific optical rotation is –20°.

(A) 83.3% **(B)** 16.7% **(C)** 91.6% **(D)** 74 %

3. If 33.8 g of (+) MSG was put in 338 ml solution and was mixed with 16.9 g of (–) MSG put in 16.9 ml solution and the final solution was passed through 400 mm tube. Find out observed rotation of the final solution.

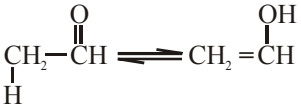
(A) +1.6° **(B)** +4.8° **(C)** +3.2° **(D)** None of these

Comprehension # 5

Tautomerism

Structural isomers that undergo rapid interconversions and exist in dynamic equilibrium are known as Tautomers and relationship between then is known Tautomerism. Tautomers generally have different functional groups.

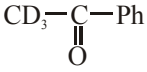
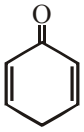
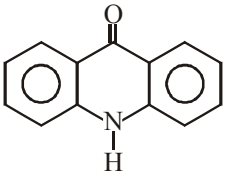
At equilibrium more stable tautomers is present in higher amount but the ratio remains same until and unless change is make externally. Tautomerism actually arises due to rapid oscillation of an atom between two polyvalent atoms in a molecule.



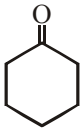
Keto form enol form

Above is an example of Keto-enol tautomerism. Conditions for this type of keto enol tautomerism is presence of α-H. Amount of enol at equilibrium is known as enolic content. It is more if enol is more stable and less if keto is more stable.

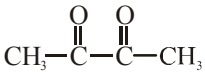
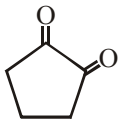
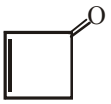
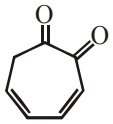
1. Which of the following can tautomerise.

(A)  **(B)**  **(C)**  **(D)** All

2. Tautomer of which of the following can show geometrical isomerism.

(A) CH_3-CHO **(B)** CH_3CH_2-CHO **(C)** $(CH_3)_2CH-CH=O$ **(D)** 

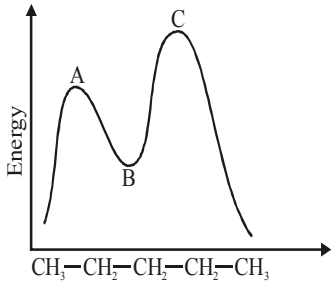
3. Which of the following compounds have higher enolic content than Keto content.

(I)  (II)  **(C)**  **(D)** 

(A) II & IV **(B)** I, II & IV **(C)** II, III & IV **(D)** II Only

Comprehension # 6

Dienes are of three types, Cumulated, conjugated and isolated diene. A, B and C are three isomeric pentadienes. They differ in their energies which is plotted with their product of hydrogenation.



Study the graph and answer the following question.

1. Which one of the following is having maximum sp^2 carbons atoms in line one after the other in the parent carbon chain.

(A) A **(B)** B **(C)** C **(D)** None of these

2. Which one of the following is having two π bonds on the same carbon.

(A) A **(B)** B **(C)** C **(D)** None of these

3. How many open chain structural isomers are possible for Molecular formula C_5H_8 other than these three pentadienes mentioned above.

(A) 6 **(B)** 8 **(C)** 9 **(D)** None of these

Exercise # 4 [Subjective Type Questions]

1. 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.

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

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

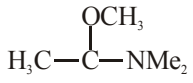
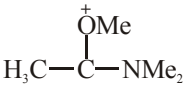
4. Why does cyclopentene not exhibit geometric isomerism though it has a double bond.

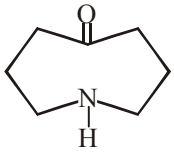
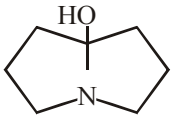
5. Why does 2-butene exhibit cis-trans isomerism but 2-yne does not?

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

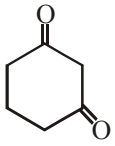
7. How will you distinguish between Maleic acid and Fumaric acid?

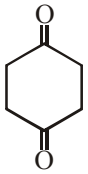
8. Which of the following pairs show tautomerism.

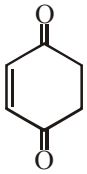
(a)  and 

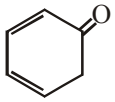
(b)  and 

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

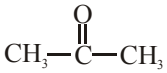

I

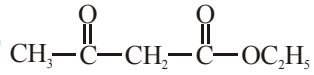

II

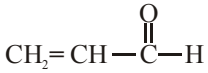

III

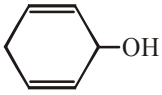

IV

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

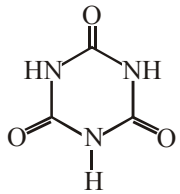
(i) 

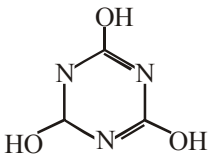
(ii) 

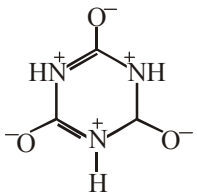
(iii) 

(iv) 

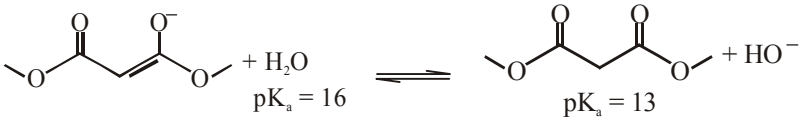
11. What is relation between **(a)**, **(b)**, **(c)** ?

(a) 

(b) 

(c) 

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



13. (+) 2-butanol has specific rotation of +13.9° when measured in pure form.Asample of 2-butanol was found to have an optical rotation of -3°. What is the stereomeric composition of this mixture ?

14. Assign Cahn-ingold prelog priorities 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

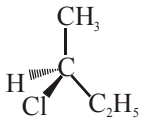
15. Discuss the optical activity of tertiary amines of the type $R_1R_2R_3N$:

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

17. 2,4-Hexadiene has three geometrical isomers. Draw their structures.

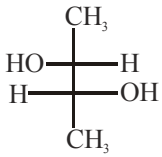
18. Identify whether the stereogenic centre is present or not :
(i) 2-Cyclo penten - 1- ol **(ii)** 3-cyclo penten-1-ol **(ii)** 2-bromopentane **(iv)** 3-bromopentane

19. Draw the enantiomer of the following structure :

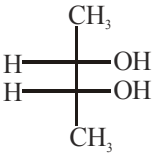


20. Assign R and S configuration to the chiral carbons in the following :

(i)



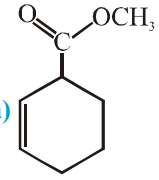
(ii)



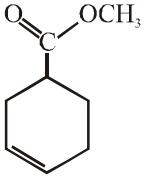
21. Mention the specific type of isomerism exhibited by each of the following pairs :
(a) 1,2-dichloro ethane and 1,1-dichloro ethane
(b) Propanoic acid and methyl acetate
(c) Methyl acetate and ethyl formate
(d) o-Nitrophenol and P-nitrophenol
(e) Anisole and o-cresol
(f) Phenol and Cyclohexa-2,4-dien-1-one

22. In each of the following pairs which will have less enol content :

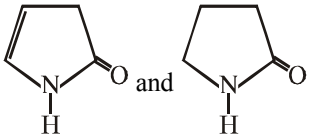
(a)



and

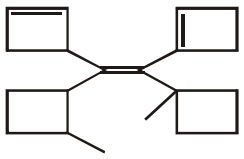


(b)

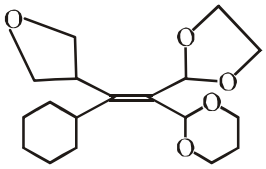


23. Assing E & Z configuration ?

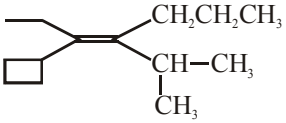
(I)



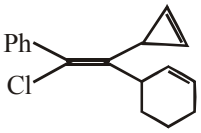
(II)

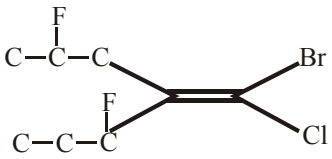


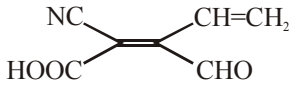
(III)

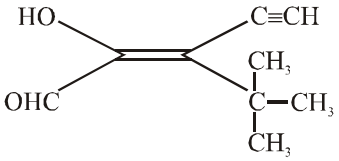


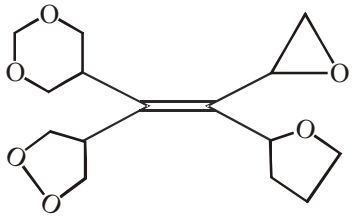
(IV)

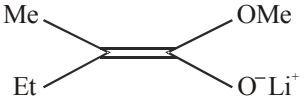


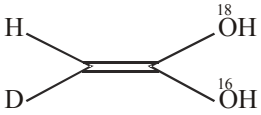
(V) 

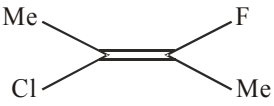
(VI) 

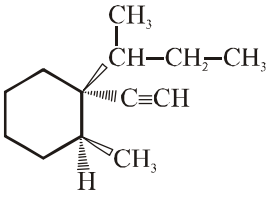
(VII) 

(VIII) 

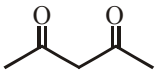
(IX) 

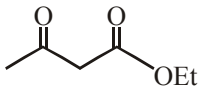
(X) 

(XI) 

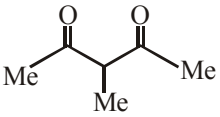
(XII) 

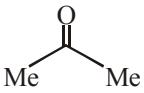
24. Decreasing order of enol content of the following. (along with proper explanation).

(a) 

(b) 

(c) 

(d) 

(e) 

25. Draw the two chair conformers of each compound and indicate which conformer is more stable.

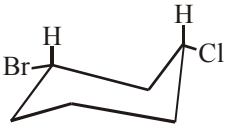
(a) cis-1-ethyl-3-methylcyclohexane
(b) trans-1-ethyl-2-isopropylcyclohexane
(c) trans-1-ethyl-2-methylcyclohexane
(d) trans-1-ethyl-3-methylcyclohexane
(e) cis-1-ethyl-3-isopropylcyclohexane
(f) cis-1-ethyl-4-isopropylcyclohexane

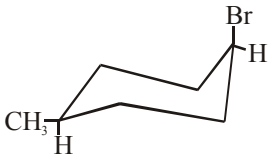
26. Considering rotation about the C-3 – C-4 bond of 2-methylhexane.

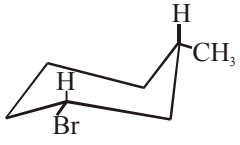
(a) Draw the Newman projection of the most stable conformer.
(b) Draw the Newman projection of the least stable conformer.

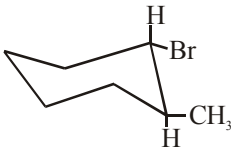
27. Draw the most stable conformer of N-methylpiperidine.

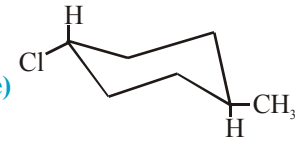
28. Determine whether each of the following compounds is a cis isomer or a trans isomer.

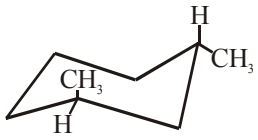
(a) 

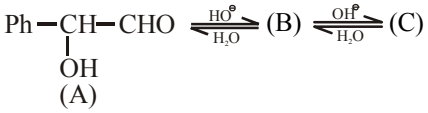
(b) 

(c) 

(d) 

(e) 

(f) 

29. 

(A), **(B)** and **(C)** are structural isomers and isomerization is effectively carried out by trace of base. Give structure of **(B)** and **(C)** and also write base catalysed mechanism for this interconversion.

30. Write down all the isomers of formula $C_7H_7O_2N$. What type of isomerism they show?

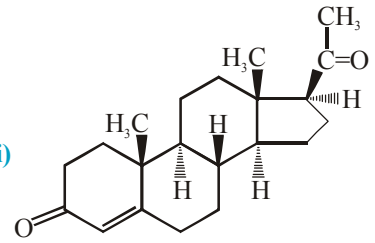
31. Write the structure of :

(i) (E) penta-1,3-diene **(ii)** (2Z, 4E)hexa-2,4-diene

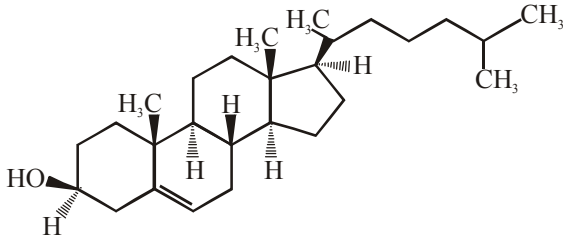
(iii) (2E, 4E)-3-ehtylhexa-2,4-diene **(iv)** (R)-2-Bromopentane

(v) (S)-3-bromo-3-chlorohexane **(vi)** (2S, 3R)-2,3-dibromobutane

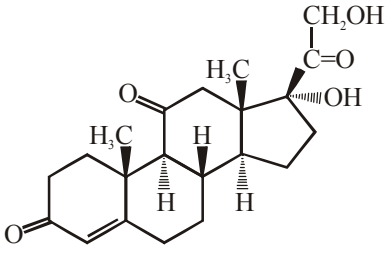
32. Calculate the total number of chiral carbon atoms in.

(i) 

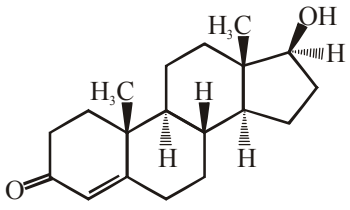
Progesterone
(human female sex hormone)

(ii) 

Cholesterol
(important component of membranes : principal component of gallstones)

(iii) 

Cortisone
(antiinflammatory hormone)

(iv) 

Testosterone
(human male sex hormone)

33. Assign the priority order number to the following atoms or groups.

(a) $-CHO, -CH_2OH, -CH_3, -OH$

(b) $-Ph, -CH(Me)_2, -H, -NH_2$

(c) $-COOH, -Ph, -CHO, -CH=CH_2$

(d) $-CH(Me)_2, -CH=CH_2, -C\equiv CH, -Ph$

(e) $-CH_3, -CH_2Br, -CH_2OH, -CH_3Cl$

(f) $-H, -N(Me)_2, -Me, -OMe$

(g) $-CH=CH_2, -Me, -Ph, -Et$

(h) $-CH_2-CH_2-Br, -Cl, -CH_2-CH_2-CH_2-Br, (Me)_2CH-$

(i) $-Cl, -Br, -I, -NH_2$

(j) $NH_2, NO_2, CH_2NH_2, C\equiv N$

34. Find out the total number of cyclic isomers of C_6H_{12} while which are optically active ?

(i) (E) penta-1,3-diene

(ii) (2Z, 4E)hexa-2,4-diene

(iii) (2E, 4E)-3-3-ethylhexa-2, 4-diene

(iv) (R)-2-Bromopentane

(v) (S)-3-bromo-3-chlorohexane

(vi) (2S, 3R)-2,3-dibromobutane

35. Find out the total number of cyclic structural isomers of C_6H_{12}.

36. How many pair(s) of geometrical isomers are possible with C_6H_{12} (only in open chain structures).

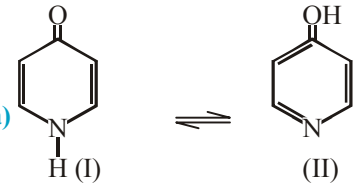
37. How many pair(s) of geometrical isomers are possible with C_6H_{12} (only is open chain structures)

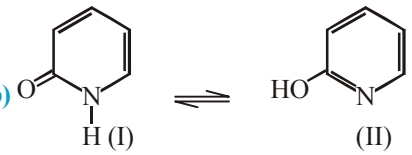
38. How many benzenoid isomer are possible for cresol.

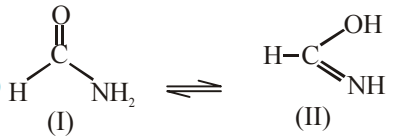
39. Calculate the total number of structural isomers of 3°-amines for the molecular formula $C_6H_{15}N$ are ?

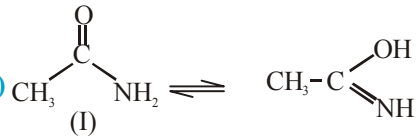
40. Calculate the number of Benzenoid isomers possible for C_6H_3ClBrI.

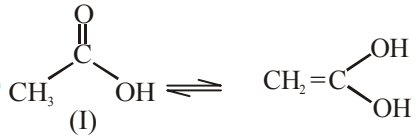
41. In each of the following pairs which is more stable :

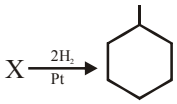
(a) 

(b) 

(c) 

(d) 

(e) 

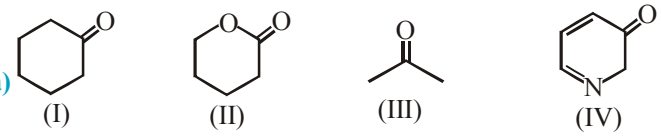
42. 

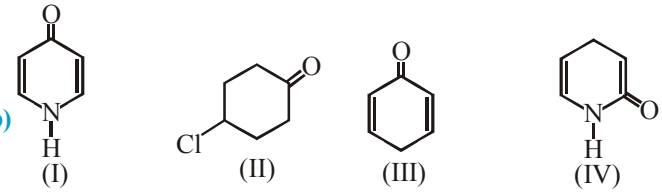
Find out total number of structures of X.

43. How many cyclopentane structures (excluding stereo isomer) are possible for C_7H_{14}.

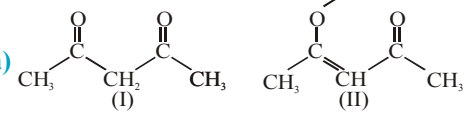
44. How many isomers with cyclopentane ring (including stereo) are possible for C_7H_{14}.

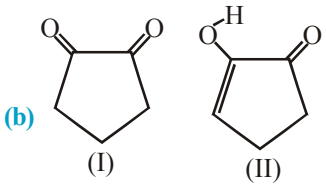
45. In each of the following sets of compounds write the decreasing order of % enol content.

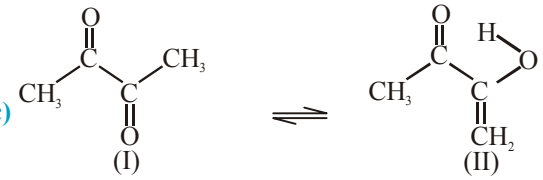
(a) 

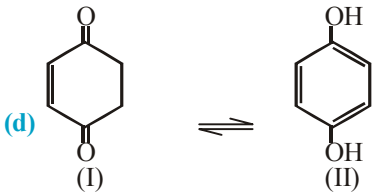
(b) 

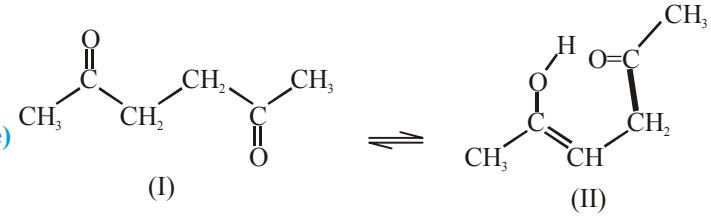
46. In each of the following pairs which is more stable :

(a) 

(b) 

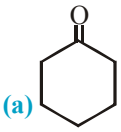
(c) 

(d) 

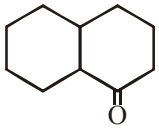
(e) 

47. In each of the following sets of compounds write the decreasing order of % enol content.

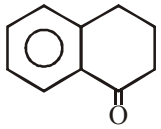
(a)



(I)

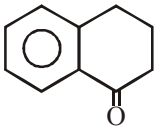


(II)

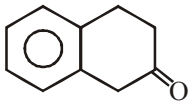


(III)

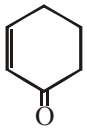
(b)



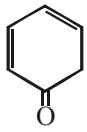
(I)



(II)

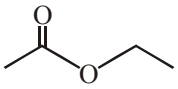


(III)

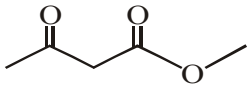


(IV)

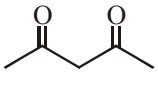
48. In each of the following sets of compounds write the decreasing order of % enol content.



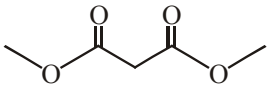
(I)



(II)

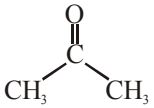


(III)

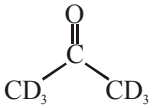


(IV)

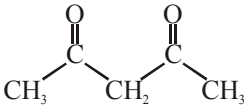
49.



(I)



(II)



(III)

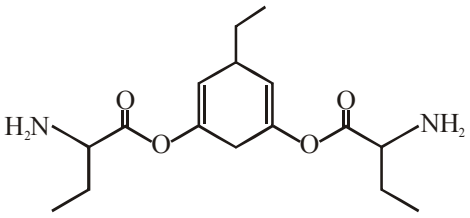
Among these gives ease of enolization.

50. Calculate the total number of cyclic isomeric carbonyl compounds of molecular formula C_5H_8O which cant' show geometrical isomerism.

51. Calculate the total number of open chain isomeric carbonyl compounds of molecular formula C_5H_8O which can't show geometrical isomerism.

52. How many enantiomers are possible on monochlorination of isopentane.

53. How many stereocenter and pseudochirality centre present in the following compound ?



54. How many monochlorinated products of methyl cyclohexane are optically active.

55. Calculate the number of chiral center in the molecule Ethyl -2,2-dibromo-4-ethyl-6-methoxy cyclohexane carboxylate.

Exercise # 5 Part # I [Previous Year Questions] [AIEEE/JEE-MAIN]

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

(A) 1-chloropentane **(B)** 2-chloropentane
(C) 1-chloro-2-methyl pentane **(D)** 3-chloro-2-methyl pentane

2. Of the five isomeric hexanes, the isomer which can give two monochloronated compounds is - **[AIEEE-2005]**

(A) 2-methyl pentane **(B)** 2,2-dimethyl butane
(C) 2,3-dimethyl butane **(D)** n-hexane

3. Which types os isomerism is shown by 2,3-dichloro butane - **[AIEEE-2005]**

(A) structural **(B)** geometric **(C)** optical **(D)** diastereo

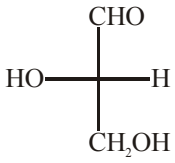
4. Increasing order of stability among the three main conformations (i.e. Eclipse, Anti, Gauche) of 2-flouroethanol is **[AIEEE-2006]**

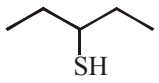
(A) Gauche, Eclipse, Anti **(B)** Eclipse, Anti, Gauche
(C) Anti, Gauche, Eclipse **(D)** Eclipse, Gauche, Anti

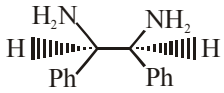
5. Which one of the following conformations of cyclohexane is chiral ? **[AIEEE-2007]**

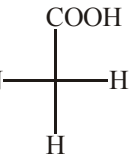
(A) Twist boat **(B)** Rigid **(C)** Chair **(D)** Boat

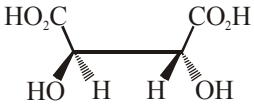
6. Which of the following molecules is expected to rotated the plane of plane-polarised light? **[AIEEE-2007]**

(A) 

(B) 

(C) 

(D) 

7. The absolute configuration of 

is **[AIEEE-2008]**

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

8. α – D – (+) – glucose and β – D–(+) –glucose are **[AIEEE-2008]**

(A) conformers **(B)** epimers **(C)** anomers **(D)** enantiomers

9. The alkene that exhibits geometrical isomerism is - **[AIEEE-2009]**

(A) 2-butene **(B)** 2-methyl-2-butene **(C)** Propene **(D)** 2-methyl propene

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

(A) 4 **(B)** 6 **(C)** 3 **(D)** 2

11. Out of the following, the alkene that exhibits optical isomerism is :- **[AIEEE-20010]**

(A) 2-methyl-2pentene **(B)** 3-methyl-2-pentene
(C) 4-methyl-1-pentene **(D)** 3-methyl-1-pentene

12. Identify the compound that exhibits tautomerism :- **[AIEEE-20011]**

(A) 2-Pentanone **(B)** Phenol **(C)** 2-Butene **(D)** Lactic acid

13 How many chiral compounds are possible on monochlorination of 2-methyl butane? **[AIEEE-20012]**

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

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

(A) Neohexane **(B)** Tertiary butyl chloride **(C)** Neopentane **(D)** Isohexane

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

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

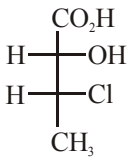
16. Maleic acid and fumaric acids are :- **[AIEEE-2012(Online)]**

(A) Tautomers **(B)** Chain isomers
(C) Geometrical isomers **(D)** Functional isomers

17. Which of the following compounds will exhibit geometrical isomerism ? **[JEE MAIN-2015]**

(A) 2-Phenyl-1-butene **(B)** 1, 1-Diphenyl-1-propane
(C) 1-Phenyl-2-butene **(D)** 3-Phenyl -1-butene

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

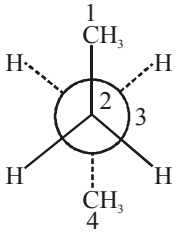


is:

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

Part # II [Previous Year Questions][IIT-JEE ADVANCED]

1. 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

2 $CH_3-\underset{\displaystyle CH_3}{\overset{|}{C}}H-CH_2-CH_3 \xrightarrow{Cl_2/hv} N$ (no. of isomers) $\xrightarrow{\text{Fractional distilation}}$ (F), (N) and (F) are : **[IIT-2006]**

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

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

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

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

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

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

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

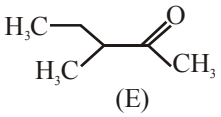
(A) Statement-1 is True, Statement-2 is True; Statement - 2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement - 2 is NOT a correct explanation for Statement-1

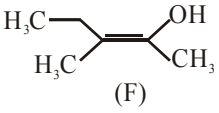
(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

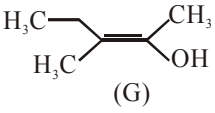
6. The correct statement(s) concerning the structures E, F and G is (are) **[IIT-2008]**



(E)



(F)



(G)

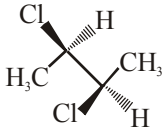
(A) E, F and G are resonance structures

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

(C) F and G are geometrical isomers

(D) F and G are diastereomers

7. 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

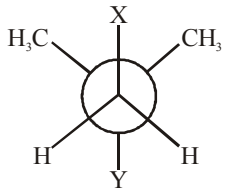
8. The correct statement(s) about the compound $H_3C(HO)HC-CH=CH-CH(OH)CH_3$ (X) is (are) : **[IIT-2009]**

(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 Xis cis, the number of enantiomers possible for X is 2.

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

(A) 1 **(B)** 10 **(C)** 100 **(D)** 1000

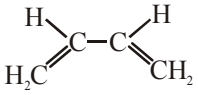
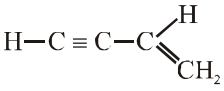
10. In the Newman projection for 2,2-dimethylbutane **[IIT-2010]**



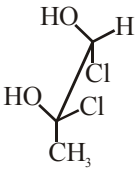
X and Y can respectively be -

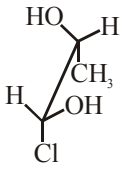
(A) H and H **(B)** H and C_2H_5 **(C)** C_2H_5 and H **(D)** CH_3 and CH_3

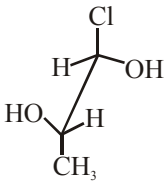
11. Amongest the given option, the compound(s) in which all the atom are in one plane in all the possible conformations (if any), is (are) – **[IIT-2011]**

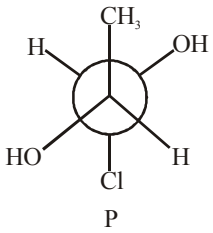
(A)  **(B)**  **(C)** $H_2C=C=O$ **(D)** $H_2C=C=CH_2$

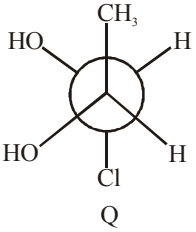
12. Which of the given statement(s) about N, O, P and Q with respect to M is (are) correct? **[IIT-2012]**


M


N

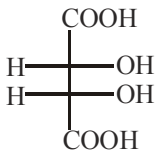

O

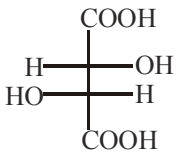

P

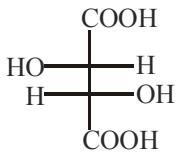

Q

(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. P and 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]**


(S)


(T)


(U)

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

14. The correct combination of names for isomeric alcohols with molecular formula $C_4H_{10}O$ is/are

[Jee advanced-2014]

(A) *tert*-butanol and 2-methylpropan-2-ol

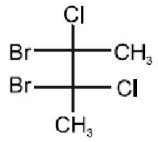
(B) *tert*-butanol and 1, 1-dimethylethan-1-ol

(C) *n*-butanol and butan-1-ol

(D) isobutyl alcohol and 2-methylpropan-1-ol

15. The total number(s) of stable conformers with non-zero dipole moment for the following compound is (are)

[Jee advanced-2014]

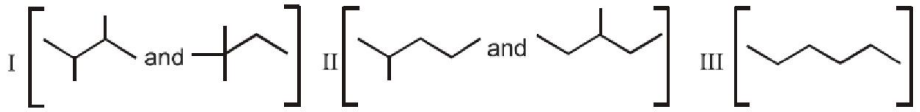


16. Consider all possible isomeric ketones, including stereoisomers of MW = 100. All these isomers are idependently reacted with $NaBH_4$ (NOTE : stereoisomers are also reacted separately). The total number of ketones that gives a racemic product(s) is/are

[Jee advanced-2014]

17. Isomers of hexane, bases on their branching, can be divided into three distinct classes as shown in the figure.

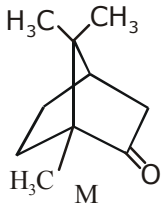
[Jee advanced-2014]



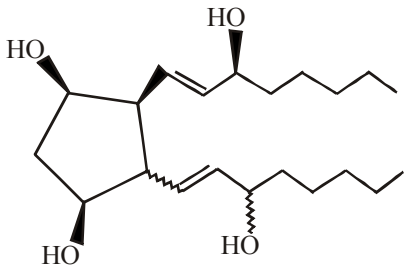
The correct order of their boiling point is

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

18. The total number of stereoisomers that can exist for M is



19. For the given compound X, the total number of optically active stereoisomers is ..... **[Jee advanced-2018]**



X

This type of bond indicates that the configuration at the specific carbon and the geometry of the double is fixed

This type of bond indicates that the configuration at the specific carbon and the geometry of the double is NOT fixed

MOCK TEST

SECTION - I : STRAIGHT OBJECTIVE TYPE

1 The number of primary, secondary and tertiary amines possible with the molecular formula C_3H_9N respectively.

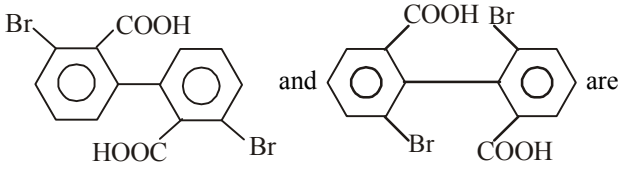
(A) 1, 2, 2 **(B)** 1, 2, 1

(C) 2, 1, 1 **(D)** 3, 0, 1

2 C_7H_7Cl shows how many benzenoid aromatic isomers ?

(A) 4 **(B)** 3

(C) 5 **(D)** 6

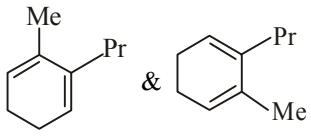
3 

are

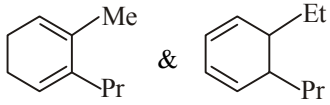
(A) Positional **(B)** Chain

(C) Geometrical **(D)** Functional

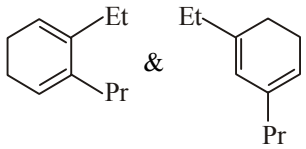
4 Which of the following has **incorrect** relation

(A) 

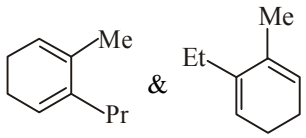
identical

(B) 

positional isomers

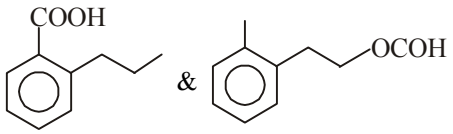
(C) 

positional isomers

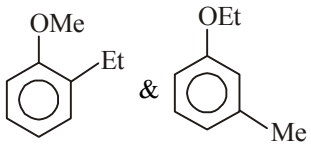
(D) 

homologues

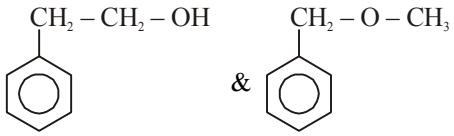
5



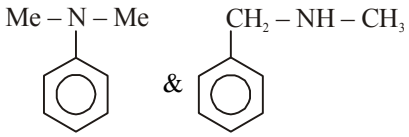
functional isomer



metamers



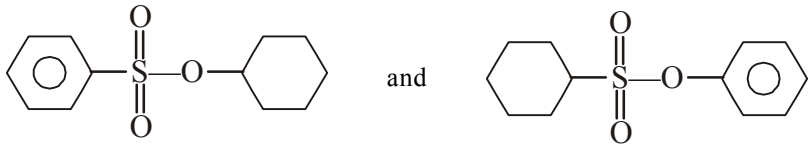
metamers



functional isomers

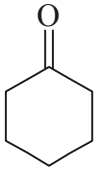
(A) TFTF **(B)** FTTF **(C)** TTFT **(D)** TFFT

6 Given compound shows which type of isomerism

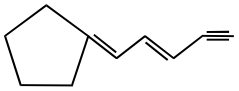


(A) Chain isomerism **(B)** Positional isomerism
(C) Metamerism **(D)** Functional group isomerism

7 Tautomer in following is Diad system :

(A) CH_3COCH_3 **(B)** $CH_3CH_2NO_2$ **(C)**  **(D)** HCN

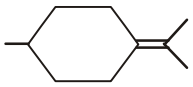
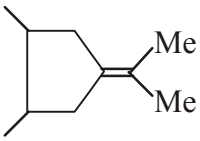
8 The number of cis-trans isomer possible for the following compound

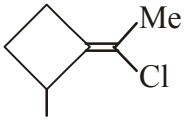


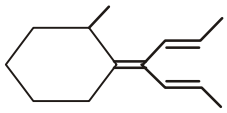
(A) 2 **(B)** 4 **(C)** 6 **(D)** 8

9 Which of the following have zero dipole moment?
(A) benzene 1,4- diol
(B) trans-1,2-dichloro ethene
(C) cis-1,2-dichloro ethene
(D) 1,1-dichloro ethene

10 Which of the following will not show geometrical isomerism.

(A)  **(B)** 

(C) 

(D) 

11 Increasing order of stability among the three main conformation (i.e. eclipse, anti, gauche) of ethylene glycol is :

(A) Eclipse, gauche, anti **(B)** Gauche, eclipse, anti

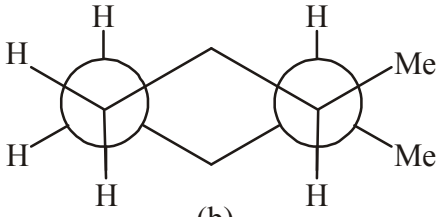
(C) Eclipse, anti, gauche **(D)** Anti, gauche, eclipse

12 How many structural isomeric primary amines are possible for the formula $C_4H_{11}N$?

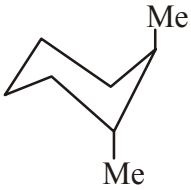
(A) 2 **(B)** 3 **(C)** 4 **(D)** 5

13 The correct stability order of the following species is

(a)



(b)

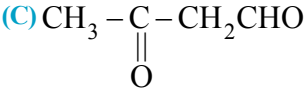


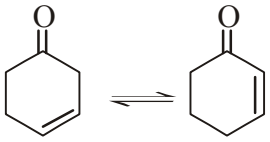
(c)

(A) c < a < b **(B)** c = b < a **(C)** c < a = b **(D)** a = b = c

14 Among the following the compounds having the highest enol content :

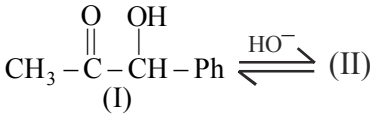
(A) CH_3CHO **(B)** CH_3COCH_3

(C)  **(D)** $CH_3–CO–CH_2–CO_2CH_3$

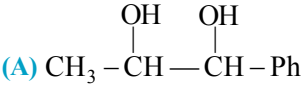
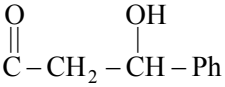
15 

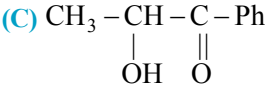
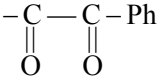
Above interconversion takes place in

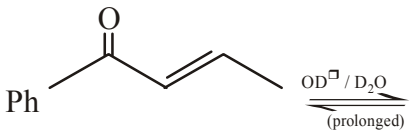
(A) Acidic medium **(B)** Basic medium **(C)** Both **(D)** None

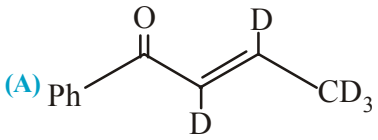
16 
(I) (II)

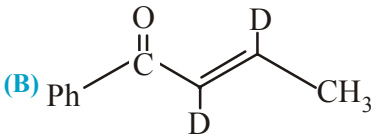
(I) isomerizes to **(II)** on addition on small amount of base structure of **(II)** is

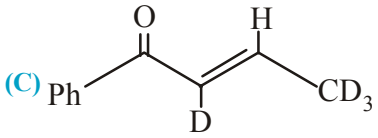
(A)  **(B)** 

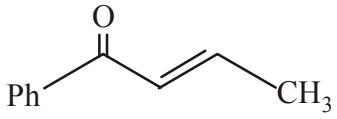
(C)  **(D)** 

17  **(P)** final product is ?

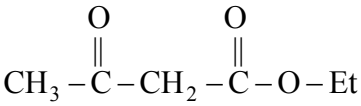
(A) 

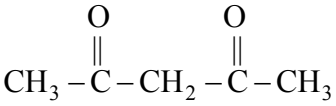
(B) 

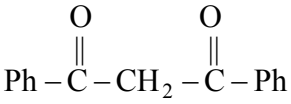
(C) 

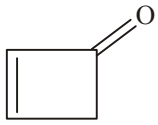
(D) 

18 Decreasing order of enol content of the following compound in liquid phase

(A) 

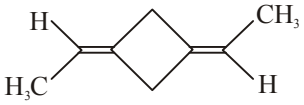
(B) 

(C) 

(D) 

(A) a > b > c > d **(B)** c > b > a > d **(C)** c > b > d > a **(D)** b > c > a > d

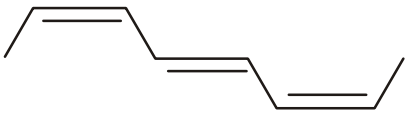
19 The IUPAC name of the given compound is



(A) 2, 4-di[(E)-ethylidene] cyclobutane
(B) 1, 3-di-[(E)-ethylidene] cyclobutane
(C) 1, 4-di-E-ethyldenecyclobutane
(D) (E)-1, 4-diethylidenecyclobutane

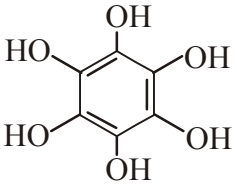
SECTION - II : MULTIPLE CORRECT ANSWER TYPE

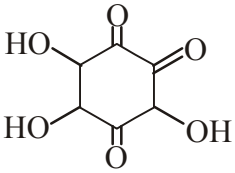
20 The IUPAC name of the compound :

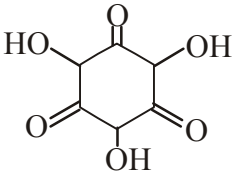


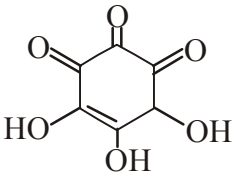
(A) (2E, 4E, 6Z)-octa-2,4,6-triene
(B) (2E, 4E, 6E)-octa-2,4,6-triene
(C) (2Z, 4E, 6Z)-octa-2,4,6-triene
(D) (2Z, 4Z, 6Z)-octa-2,4,6-triene

21 Tautomerism form of this compound is/are:



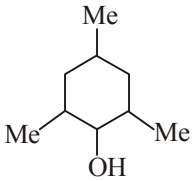
(A) 

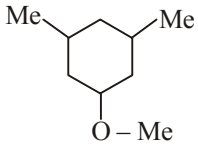
(B) 

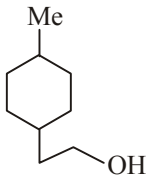
(C) 

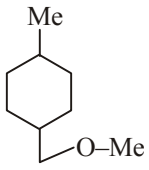
(D) All of these

22 Which of the following is not the correct relationship


I

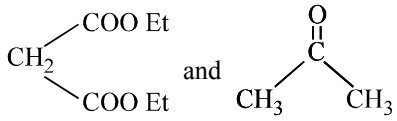

II

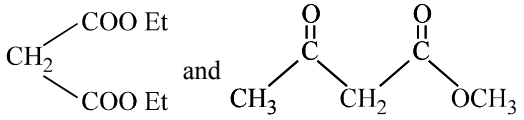

III

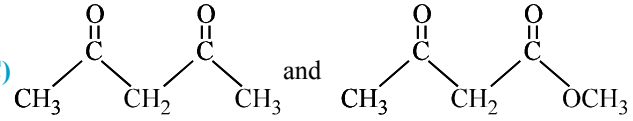

IV

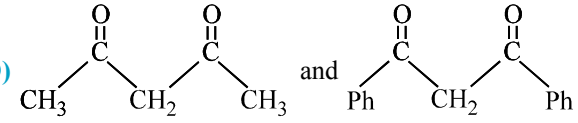
(A) II & IV are metamer
(B) I & II are functional isomer
(C) I & III are chain isomer
(D) I and IV are positional isomer

23 In which of the following pairs first will have higher enol content than second :

(A) 

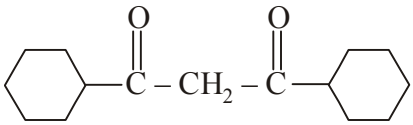
(B) 

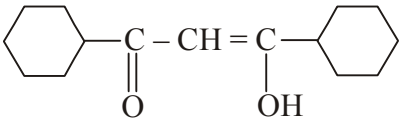
(C) 

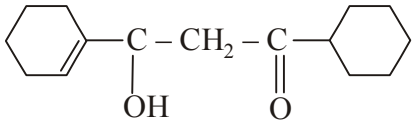
(D) 

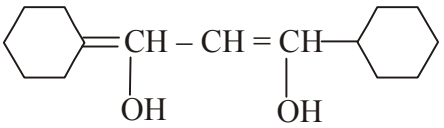
24 What statement is correct for Keto-enol tautomerism ?
(A) Tautomersim is catalysed by acid and base.
(B) Tautomers are present in dynamic equilibrium state.
(C) Generally keto form is more stable than enol form in mono Ketones.
(D) Atomic arrangements are same in tautomerism

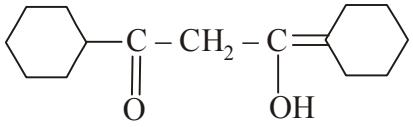
25 Tautomer of following compound is :



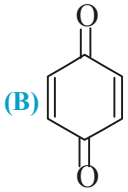
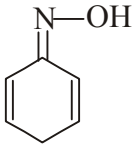
(A) 

(B) 

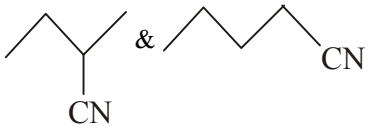
(C) 

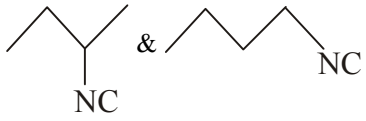
(D) 

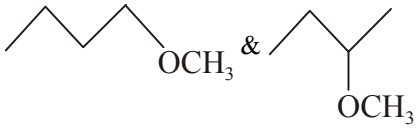
26 Which compound show tautomerism

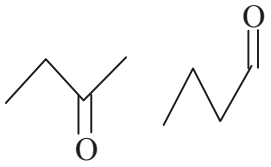
(A) Ph–NO **(B)**  **(C)**  **(D)** HCHO

27 Identify the position isomer.

(A) 

(B) 

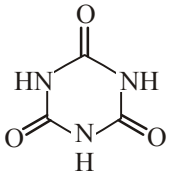
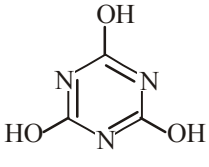
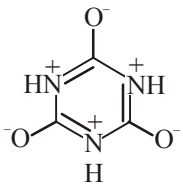
(C) 

(D) 

28 Enolic form of acetyl acetone is stabilised due to :

(A) resonance as a result of conjugation **(B)** intramolecular hydrogen bonding
(C) van der waals force **(D)** dipole-dipole repulsion

29 What is relation between **(I)**, **(II)** and **(III)** ?

(I)  **(II)**  **(III)** 

(A) I and II are tautomers **(B)** III is conjugate base of II
(C) III is resonance structure of I **(D)** no relation exists

30 An organic compound with molecular formula C_2H_5NO contains doubly linked atoms. It shows:

(A) chain isomerism **(B)** geometrical isomerism
(C) tautomerism **(D)** positional isomerism

31 Which of the following can exist in 'syn' and 'anti' form ?

(A) $C_6H_5—N=N—OH$

(B) $C_6H_5—N=N—C_6H_5$

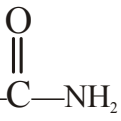
(C) $C_6H_5—C=N—OH$

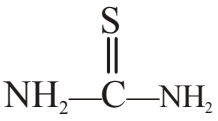
(D) $(C_6H_5)_2C=N—OH$

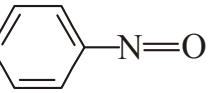
32 Which of the following is correctly mathed ?

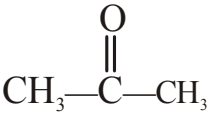
Compound		Number of geometrical isomers
(A) $CH_3—CH=CH—CH=CH—C_2H_5$	→	4
(B) $CH_3—(CH=CH)_4—CH_3$	→	2
(C) $CH_2=CH—CH=CH_2$	→	$2^3+2^1=10$
(D) $CH_3(—CH=CH)_5—CH_3$	→	$2^4+2^2=20$

33 Which of the following compounds show tautomerism ?

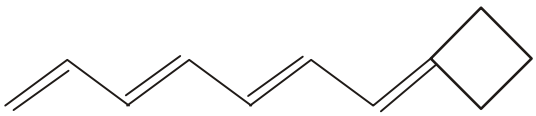
(A) 

(B) 

(C) 

(D) 

34 Total number of geometrical isomer of following compound.



(A) 2 **(B)** 4 **(C)** 8 **(D)** 16

SECTION - III : ASSERTION AND REASON TYPE

35 **Statement-1** : E-cyclopentadecene is having more ΔH_C (Heat of combustion) than Z isomer.

Statement-2 : E-cyclopentadecene is more stable than Z isomer.

(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.

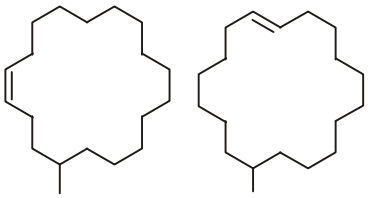
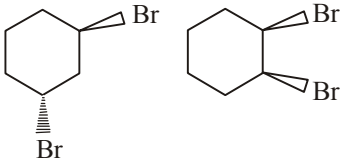
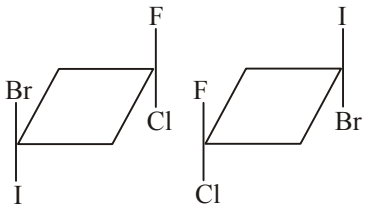
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.

(C) Statement-1 is true, statement-2 is false.

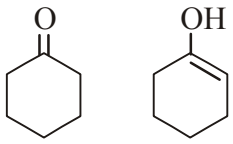
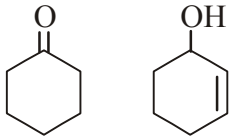
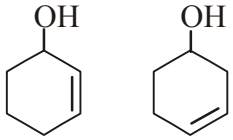
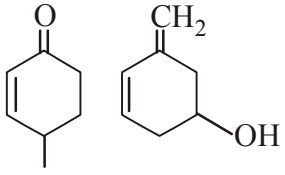
(D) Statement-1 is false, statement-2 is true.

SECTION - IV : MATRIX - MATCH TYPE

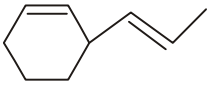
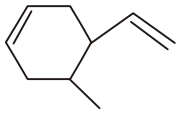
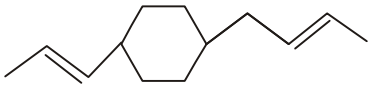
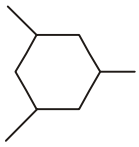
36

Column-I		Column-II	
(A)		(P)	Geometrical isomers
(B)		(Q)	Structural isomer
(C)		(R)	Number of Geometrical isomer of first compound is even number
		(S)	Number of Geometrical isomer of second compound is even number

37 Match the column :

Column I		Column II	
(A)		(P)	Tautomers
(B)		(Q)	Structural isomers
(C)		(R)	Position isomers
(D)		(S)	Atleast one of the two structures is enol

38

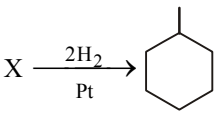
Column I Compound		Column II Number of geometrical isomers	
(A)		(P)	2
(B)		(Q)	4
(C)		(R)	6
(D)		(S)	8

SECTION - V : SUBJECTIVE TYPE

39 Calculate the number of Benzenoid isomers possible for C_6H_3ClBrI.

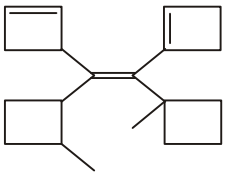
40 Calculate the total number of structural isomers of 3°-amines for the molecular formula $C_6H_{15}N$ are?

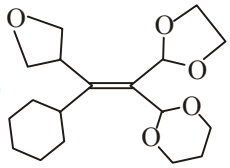
41 How many cyclopentane structures (excluding stereo isomer) are possible for C_7H_{14}.

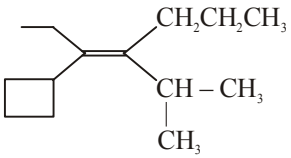
42 

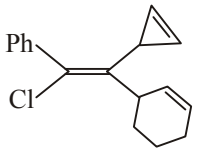
Find out total number of structures of X.

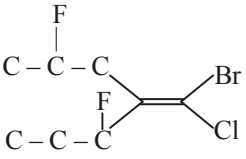
43 Assign E & Z configuration?

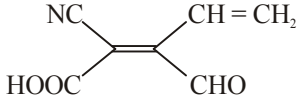
(I) 

(II) 

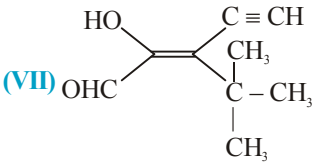
(III) 

(IV) 

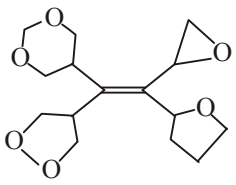
(V) 

(VI) 

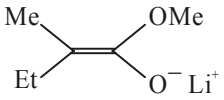
(VII)



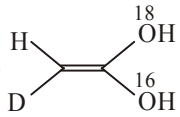
(VIII)



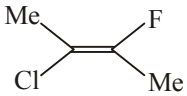
(IX)



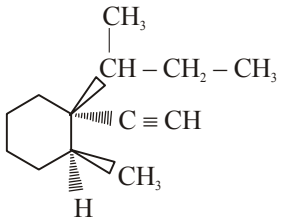
(X)



(XI)



(XII)



44 Write down all the isomers of formula $C_7H_7O_2N$. What type of isomerism they show?

45 Assign the priority order number to the following atoms or groups.

(a) –CHO, $–CH_2OH$, $–CH_3$, –OH

(b) –Ph, $–CH(Me)_2$, –H, $–NH_2$

(c) –COOH, –Ph , –CHO, $–CH = CH_2$

(d) $–CH(Me)_2$, $–CH=CH_2$, –C≡CH, –Ph

(e) $–CH_3$, $–CH_2Br$, $–CH_2OH$, $–CH_3Cl$

(f) –H, $–N\ (Me)_2$, –Me, –OMe

(g) $–CH = CH_2$, –Me, – Ph, –Et

(h) $–CH_2–CH_2–Br$, –Cl, $–CH_2–CH_2–CH_2–Br$, $(Me)_2CH–$

(I) –Cl, –Br, –I, $–NH_2$

(j) NH_2 , NO_2 , CH_2NH_2 , C≡N

ANSWER KEY

EXERCISE - 1

1.	C	**2.**	C	**3.**	B	**4.**	C	**5.**	A	**6.**	D	**7.**	C	**8.**	C	**9.**	A	**10.**	C	**11.**	B	**12.**	C	**13.**	C
14.	C	**15.**	C	**16.**	D	**17.**	B	**18.**	A	**19.**	C	**20.**	B	**21.**	D	**22.**	D	**23.**	B	**24.**	C	**25.**	A	**26.**	A
27.	D	**28.**	B	**29.**	A	**30.**	B	**31.**	B	**32.**	B	**33.**	C	**34.**	D	**35.**	C	**36.**	B	**37.**	C	**38.**	D	**39.**	C
40.	C	**41.**	D	**42.**	A	**43.**	D	**44.**	B	**45.**	C	**46.**	A	**47.**	A	**48.**	C	**49.**	C	**50.**	A	**51.**	C	**52.**	B
53.	B	**54.**	D	**55.**	C	**56.**	B	**57.**	B	**58.**	D	**59.**	B												

EXERCISE - 2 : PART # I

1.	A, C	**2.**	C	**3.**	B, D	**4.**	A, B	**5.**	B, C
6.	B, D	**7.**	B	**8.**	A, B, D	**9.**	C	**10.**	B, C
11.	A, C	**12.**	D	**13.**	A. C, D	**14.**	B, C	**15.**	A, C
16.	B	**17.**	A	**18.**	A, B, D	**19.**	A, B, D	**20.**	A, C, D
21.	A, C	**22.**	A, C	**23.**	A, D	**24.**	A, B	**25.**	A, D
26.	B, C	**27.**	A,C	**28.**	B,C,D	**29.**	A,C	**30.**	A,B
31.	B,C,D	**32.**	B,C	**33.**	A	**34.**	B		

PART # II

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

EXERCISE - 3 : PART # I

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 → (r), D → (r, s)

4. A → (r), B → (p), C → (q)

5. A → (r), B → (q), C → (s), D → (p)

6. A→ (p), B → (r), C→ (q), D → (r)

7. A → (r) - (iii), B → (e) -(iv), C → (2) -(ii), D → (1) - (i)

8. A → (ii), B → (v), C → (iv), D → (i, iv), E → (iii)

9. A → (r), B → (p), C → (q), D → (r)

PART # II

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			
Comprehension # 4 :	**1.**	D	**2.**	C	**3.**	C			
Comprehension # 5 :	**1.**	D	**2.**	B	**3.**	A			
Comprehension # 6 :	**1.**	B	**2.**	C	**3.**	A			

EXERCISE - 5 : PART # I

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

14. C **15.** C **16.** C **17.** C **18.** A

PART # II

1.	D	**2.**	B	**3.**	C	**4.**	A	**5.**	C	**6.**	BCD	**7.**	AD
8.	AD	**9.**	C	**10.**	BD	**11.**	BC	**12.**	ABC	**13.**	B		
14.	A, C, D	**15.**	3	**16.**	5	**17.**	B	**18.**	4	**19.**	7		

MOCK TEST

1.	C	**2.**	A	**3.**	A	**4.**	B	**5.**	C	**6.**	C	**7.**	D
8.	A	**9.**	B	**10.**	A	**11.**	C	**12.**	C	**13.**	C	**14.**	C
15.	C	**16.**	C	**17.**	C	**18.**	B	**19.**	B	**20.**	C	**21.**	A, B
22.	A,D	**23.**	A,C	**24.**	A,B,C	**25.**	A,C,D	**26.**	C	**27.**	B,C	**28.**	A,B
29.	A,C	**30.**	B,C	**31.**	A,B,C	**32.**	A,B	**33.**	A,B,C,D	**34.**	A		

35. D **36.** A → (Q,R,S), B → (Q,R,S), C → (P,R,S)

37. A → (P,Q,S), B → (Q,S), C → (Q,R,S), D → (Q,S)

38. A → (P), B → (P), C → (S), D → (P) **39.** 10 **40.** 7 **41.** 4 **42.** 7

43. Z – I, II, III, VI, VII ; E – IV, V, VIII, IX, X, XI, XII

44. Position isomers, Functional isomers, Tautomers isomers, Geometrical isomers

45. **(a)** 4,1,2,3 **(b)** 4,1,2,3 **(c)** 1,3,2,4 **(d)** 4,3,2,1 **(e)** 2,4,3,1 **(f)** 4,2,3,1
(g) 3,1,4,2 **(h)** 2,4,1,3 **(i)** 3,2,1,4 **(j)** 2, 1, 4, 3