Resonance
Educating for better tomorrow

TARGET : JEE (ADVANCED) 2015

Course : VIJETA & VIJAY (ADP & ADR) Date : 14-04-2015

ORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

NO. 03

TEST INFORMATION

DATE : 15.04.2015 PART TEST-01 (PT-01)

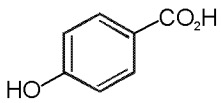
Syllabus : Mole concept, Equivalent Concept, Ionic equilibrium, Electrochemistry, Inorganic Nomenclature, Periodic table, Chemical bonding and Coordination compounds.

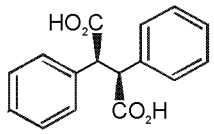
DPP No. # 03 (JEE-ADVANCED)

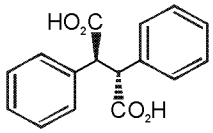
Total Marks : 170 **Max. Time : 139 min.**

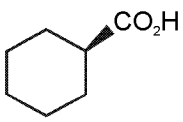
Single choice Objective (–1 negative marking) Q.1 to Q.15	(3 marks 2½ min.)	[45, 37½]
Multiple choice objective (–1 negative marking) Q.16 to Q.21	(4 marks, 3 min.)	[24, 18]
Assertion and Reason ('–1' negative marking) Q.22 to Q.24	(3 marks 2½ min.)	[09, 09]
Comprehension (–1 negative marking) Q.25 to Q.32	(3 marks 2½ min.)	[24, 20]
Single Digit Subjective Questions (no negative marking) Q.33 to Q.40	(4 marks 2½ min.)	[32, 20]
Double Digits Subjective Questions (no negative marking) Q.41	(4 marks 2½ min.)	[04, 2½]
Match the column (4 vs 4) (no negative marking) Q.42 to Q.45	(8 marks, 8 min.)	[32, 32]

1. Which of the following compounds might be useful to the chemist trying to increase the optical purity of the (d) sample ?

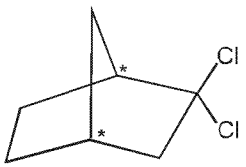
(A) 

(B) 

(C) 

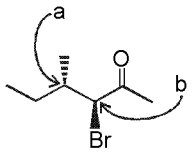
(D) 

2. Sum of total number of chiral centres (x) and total number of pairs of enantiomers (y) for following structure is :



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

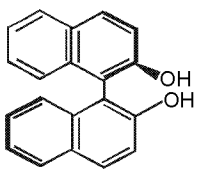
3. Determine the absolute configurations of the chiral centres in the following compound.



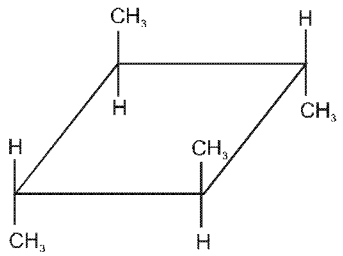
(A) a = R; b = S (B) a = R; b = R (C) a = S ; b = S (D) a = S ; b = R

4. The binaphthol (Bnp) is :

(A) an optically active compound having chiral centre
(B) an optically inactive compound
(C) a meso compound
(D) an optically active compound without having chiral centre



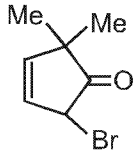
5._ The element(s) of symmetry present in the following molecule is/are :

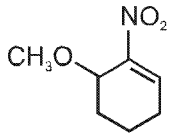


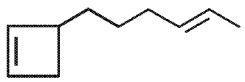
(I) Alternating axis of symmetry
(II) Plane of symmetry
(III) Axis of symmetry
(IV) Centre of symmetry

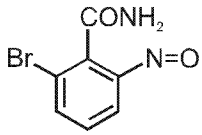
(A) I and II (B) I and III (C) I , II and III (D) I , II ,III and IV

6. Which of the following structure has incorrect IUPAC name :

(A)  2-Bromo-5,5-dimethylcyclopent-3-en-1-one

(B)  6-Methoxy-1-nitrocyclohex-1-ene

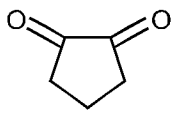
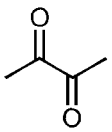
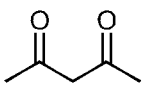
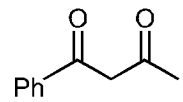
(C)  6-(Cyclobut-2-enyl)hex-2-ene

(D)  2-Bromo-6-nitrosobenzenecarboxamide

7. How many possible isomeric alkenes give 2,3-Dimethylpentane on catalytic hydrogenation.

(A) 4 (B) 6 (C) 8 (D) 5

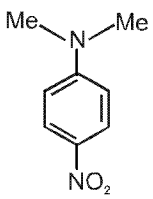
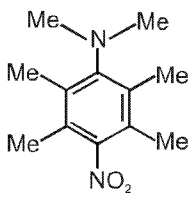
8. Order of enolic content

P :  Q :  R :  S : 

(A) P > Q > R > S (B) P > S > R > Q (C) R > S > P > Q (D) S > R > P > Q

9. Write the total number of benzenoid structural isomers of molecular formula C_8H_8O, which can give Fehling test.

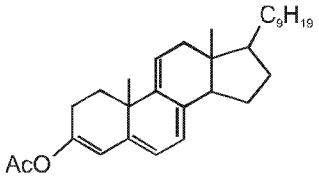
(A) 2 (B) 3 (C) 4 (D) 1

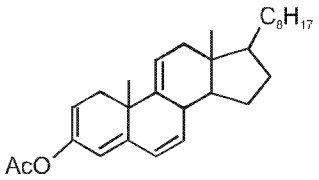
10.  (I)  (II)

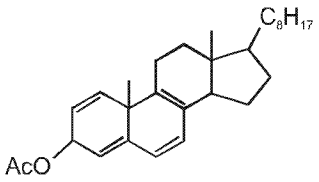
Dipole moment of above compound will be

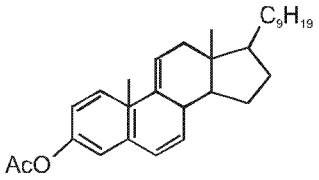
(A) I - 4.11 D ; II - 6.87 D (B) I - 6.87 D ; II - 4.11 D
(C) I - 4.11 D ; II - 4.11 D (D) I - 6.87 D ; II - 0 D

11. Which of the following compound is most stable ?

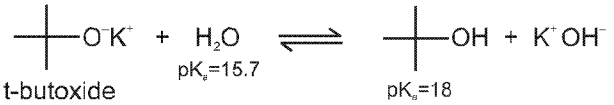
(A) 

(B) 

(C) 

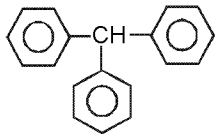
(D) 

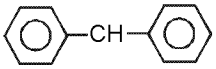
12. Which statement about the following equilibrium is true ?

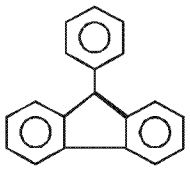


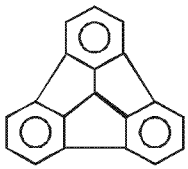
(A) The equilibrium favours the products
(B) t-Butoxide is the dominant anionic species in the equilibrium
(C) Water is the weaker acid
(D) t-Butoxide is stabilized by resonance

13. Which of the following has lowest pK_a value ?

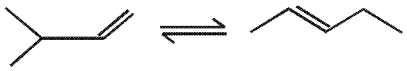
(A) 

(B) 

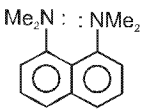
(C) 

(D) 

14. The heat of hydrogenation for 3-methylbutene and 2-pentene are –30 kcal/mol and –28 kcal/mol respectively. The heats of combustion of 2-methylbutane and pentane are –784 kcal/mole and –782 kcal/mol respectively. All the values are given under standard conditions. Taking into account that combustion of both alkanes give the same products, what is ΔH (in kcal/mol) for the following reaction under same condtions ?



(A) 0 (B) – 4 (C) –2 (D) 2

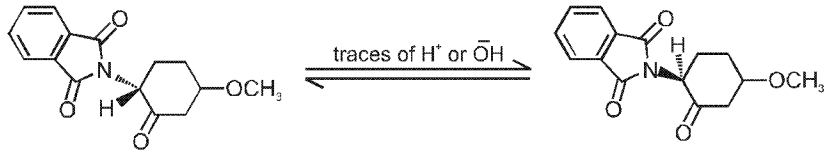
15. 

1,8-(dimethylamino) napthalene

Its basic strength is 10^{10} more than 1, 1-dimethyl amino napthalene.
Reason for high basic strength is :
(A) Resonance (B) Steric inhibition of Resonance
(C) Ortho effect (D) Hyperconjugation

16. $(C_8H_8O_2)$ is molecular formula of many acids containing an aromatic ring also.
(A) The total number of carboxylic acids (with one benzene ring) is 4.
(B) Out the three Toluic acids, the ortho isomer is the strongest acid.
(C) All these Toluic acids are weaker acids than benzoic acid.
(D) All these are weaker acids than H_2CO_3.

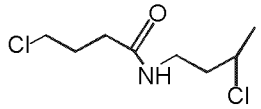
17. Select the correct statement(s) about the following reaction.

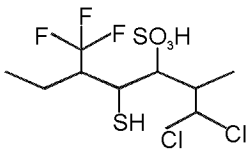


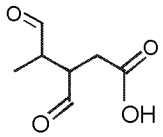
(I) (R) Thalidomide derivative (II)

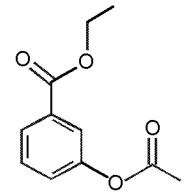
(A) It is an isomerisation reaction. (B) It is a racemisation reaction.
(C) The reaction is passing through the process of enolisation.
(D) I and II are tautomers.

18. Which of the following has correct IUPAC name ?

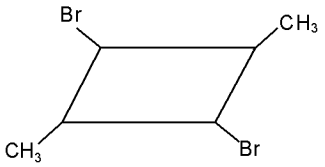
(A)  4–Chloro–N–(3–chlorobutyl)butanamide

(B)  1,1–Dichloro–4–mercapto–2–methyl–5–trifluoromethylheptane–3–sulphonic acid

(C)  3–Formyl–4–methyl–5–oxopentanoic acid

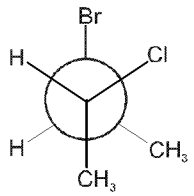
(D)  Ethylmethylbenzene–1,2–dicarboxylate

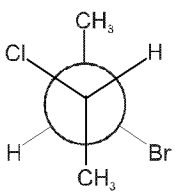
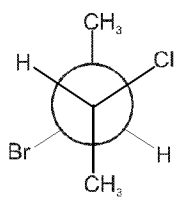
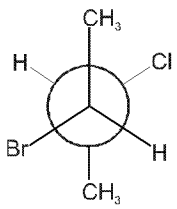
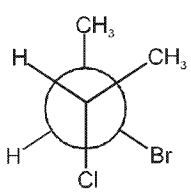
19. Mark the compound given below which have atleast one meso stereoisomers.
(A) Cyclopentane-1, 3-dicarbaldehyde (B) Hexane-1,2,3,4,5,6-hexol
(C) 2,3,4,5,6-pentahydroxyhexanal (D) 2,3-Dihydroxybutanedioic acid

20.  Choose the correct option/s according to the given compound.

(A) Total stereoisomers are five. (B) All stereoisomers are optically active.
(C) All stereoisomers are optically inactive
(D) Four stereoisomers have plane of symmetry & one has centre of symmetry

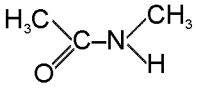
21._ Which of the following are (configurational) enantionmers of (P) ?

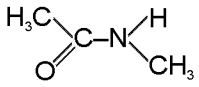
(P) = 

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

22. **Statement-1 :** Trihydroxyglutaric acid (HOOC – $(CHOH)_3$ – COOH) exist in four stereoisomeric form, two of which are optically active while other two are meso forms.
Statement-2 : It contains two asymmetric and one pseudoasymmetric carbon atoms.
(A) Statement-1 is true, Statement-2 is true; Statement-2 is correct explanation of Statement-1.
(B) Statement-1 is true, Statement-2 is true; Statement-2 is NOT correct explanation of Statement-1.
(C) Statement-1 is true, Statement-2 is false. (D) Statment -1 is false, Statement-2 is true.

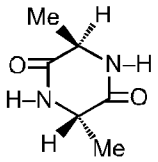
23. **Statement-1 :** There is evidence for existence of N-methylacetamide in two structural form I and II as shown below.

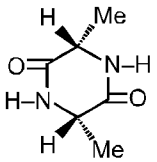

I


II

Statement-2 : Rotation about C–N bond is restricted due to resonance.
(A) Statement-1 is true, Statement-2 is true; Statement-2 is correct explanation of Statement-1.
(B) Statement-1 is true, Statement-2 is true; Statement-2 is NOT correct explanation of Statement-1.
(C) Statement-1 is true, Statement-2 is false. (D) Statment -1 is false, Statement-2 is true.

24.

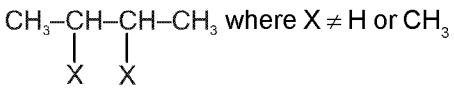

(A)


(B)

Statement-1 : A is optically active & B is optically inactive.
Statement-2 : A has centre of symmetry.
(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.

Comprehension # 1

The compound shows below in the diagram, on treatment with acid catalyst isomerizes and equilibrium is established among the stereoisomers.



The equilibrium mixture contains all the three stereoisomers of this compound. Specific rotation of pure dextro isomer is +62° while the specific rotation of the equilibrium mixture is + 22°. Also the equilibrium mixture contains 20% of the meso isomers. Answer the following three qeustions based on the above information.

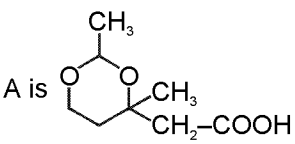
25. The percentage purity of the equilibrium mixture is :
(A) 28% (B) 35% (C) 46% (D) 54%

26. The percentage of racemic mixture present in the equilibrium mixture is :
(A) 35% (B) 45% (C) 65% (D) 80%

27. Composition of equilibrium mixture is :
(A) 20% meso, 58% dextro and 22% laevo (B) 20% meso, 60% dextro and 20% laevo
(C) 20% meso, 54% dextro and 26% laevo (D) 20% meso, 30% dextro and 50% laevo

Comprehension # 2

A research scholar synthesised the compound A in the laboratory

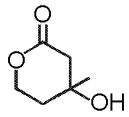
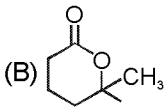
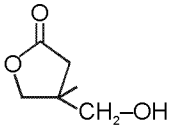


He wanted to study this compound in acidic medium and kept for some time with heating. After an hour, when isolated the compound, to this surprise, he got the mixture of two compounds B, C. He studied their properties and compound them with A

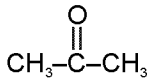
	A	B	C
Reaction with $NaHCO_3$	$\uparrow CO_2$	No reaction	No reaction
Blue litmus	red	No	No
NaOI	No	No	Yellow ppt
$[Ag(NH_3)_2]^+$	No	No	Silver mirror

[Hint : A $\xrightarrow{H_3O^{\oplus}/\Delta}$ B + C]

28. Compound B is :

(A)  (B)  (C)  (D) None

29. Compound C is :

(A)  (B) $CH_3–CH_2–CH=O$ (C)  (D) $CH_3–CH=O$

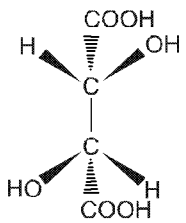
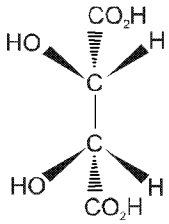
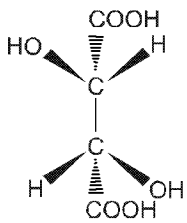
30. B is formed due to :

(A) Cleavage of C–O bond followed by esterification between –COOH & –OH present.
(B) Decarboxylation of –COOH group (C) Oxidation of $–CH_2COOH$ into –COOH
(D) None

Comprehension # 3

Tartaric acid [$HO_2CCH(OH)CH(OH)CO_2H$] was an important compound in history of stereochemistry. Two naturally occuring forms of tartaric acid are optically inactive. One optically inactive form (P) has a melting point of 210-212°C and can be separated into two optically acitve forms, whereas other optically inactive form (Q) cannot be resolved further.

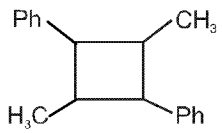
31. Optically inactive form Q is

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

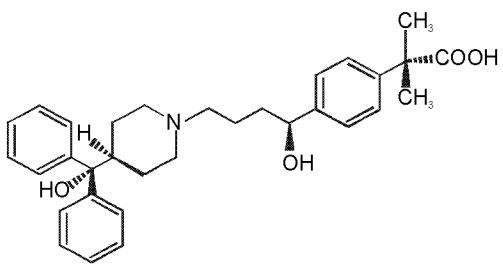
32. A optically inactive form P is :

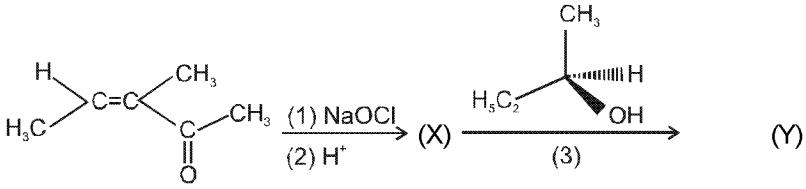
(A) Optically inactive due to internal compensation.
(B) Optically inactive due to presence of plane of symmetry.
(C) Optically inactive due to external compensation.
(D) Optically inactive due to intramoleuclar hydrogen bonding.

33. Total number of optically active forms of following compound.



34. Allegra, a common prescription drug with the structure shown below, is given for the treatment of seasonal allergies, How many stereogenic carbon does Allegra possess ?

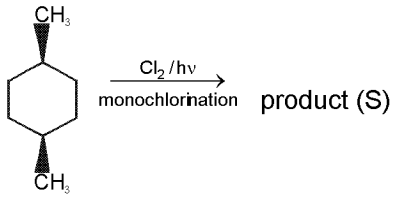


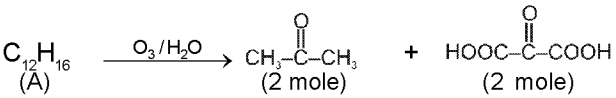
35. 

The total number of isomeric products formed is :

36. What is the number of all the structural isomers of octane with five carbons in their principal chain ?

37. How many optically active compounds are possible in the following reaction ?

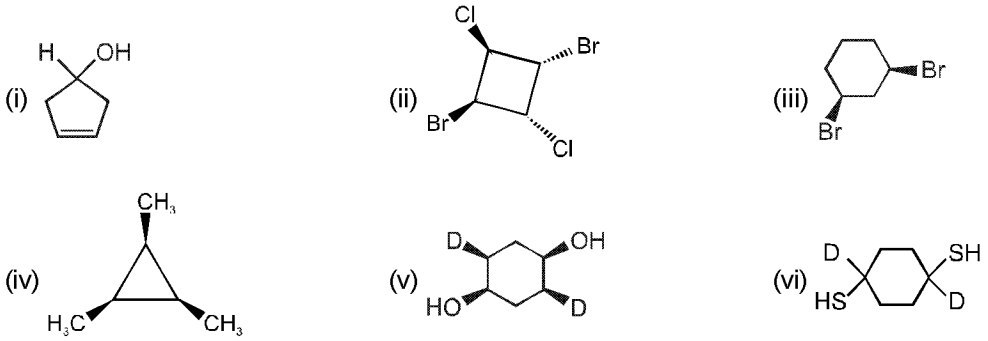


38. 

How many π bonds are present in compoud A ?

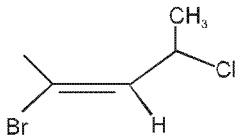
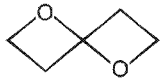
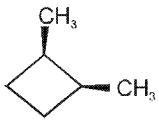
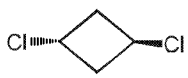
39. A smallest, optically active, acyclic alkane can obtained by catalytic hydrogenation of any of the five structural isomers of an alkene. How many of these alkenes are chiral ?

40. Calculate sum of X and Y in the given molecules.
X = Number of molecule having plane of symmetry ; Y = Number of molecule having centre of symmetry



41. A 2M solution of glyceraldehyde ($HOCH_2$–CHOH–CHO) was placed in a polarimeter tube of length 100 mm. Using the sodium D line, a rotation of 7.2° was found in clockwise direction at constant temperature. Determine the specific rotation of the compound.

42. Match the column

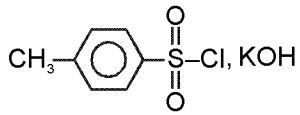
Column-I (Molecule)	**Column-II (Property)**
(A) 	(p) Chiral atom is present
(B) 	(q) Molecule is chiral
(C) 	(r) Plane of symmetry is present
(D) 	(s) Centre of symmetry is present

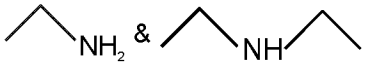
43. **Column-I (Compound)** **Column-II (used for separated between)**

(A) $NaHCO_3$ solution

(B) $NaHSO_3$

(C) dil. HCl

(D) 

(p) 

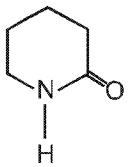
(q) Water insoluble amides & water insoluble amines

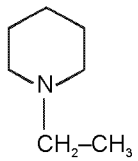
(r) $CH_3–CH_2–OH$ and $CH_3–CH=O$

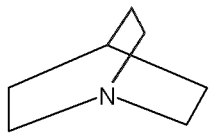
(s) Water insoluble carboxylic acids from water insoluble phenols

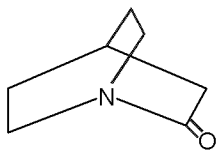
44. Match the column (I) and (II).

Column(I)
Molecule

(A) 

(B) 

(C) 

(D) 

Column (II)
pKa of conjugate acid

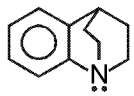
(p) 0.8

(q) 5.33

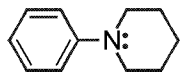
(r) 10.65

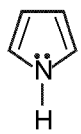
(s) 10.95

45. **Column-I (Compound)** **Column-II (PK_b values)**

(A) 

(B) 

(C) 

(D) 

(p) 13.60

(q) 6.21

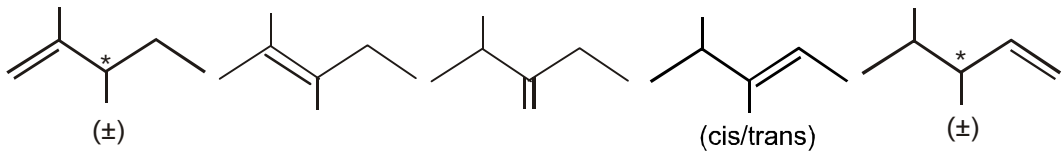
(r) 3.35

(s) 8.80

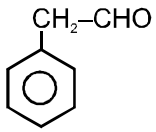
CHEMISTRY

6. Correct name is 5-Bromo-2,2-dimethylcyclopent-3-en-1-one.

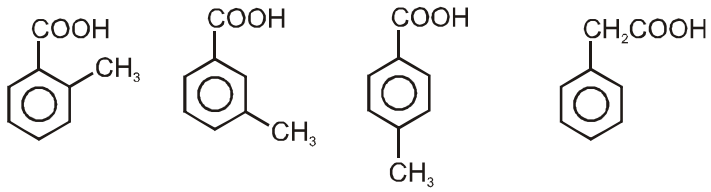
7.



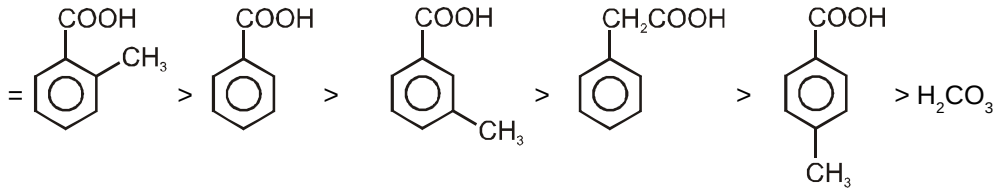
9.



16. M.F. = $C_8H_8O_2$
Isomers =

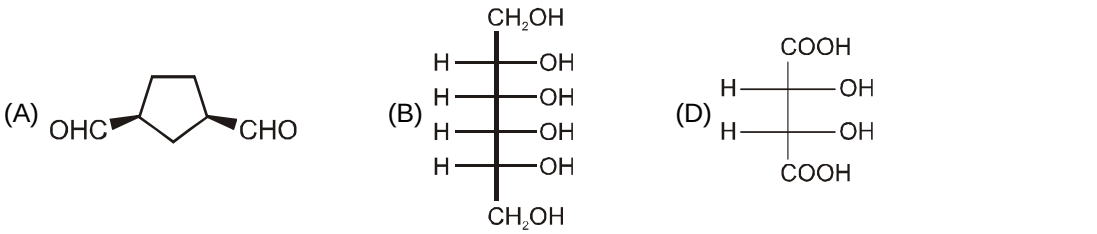


Acid strength order

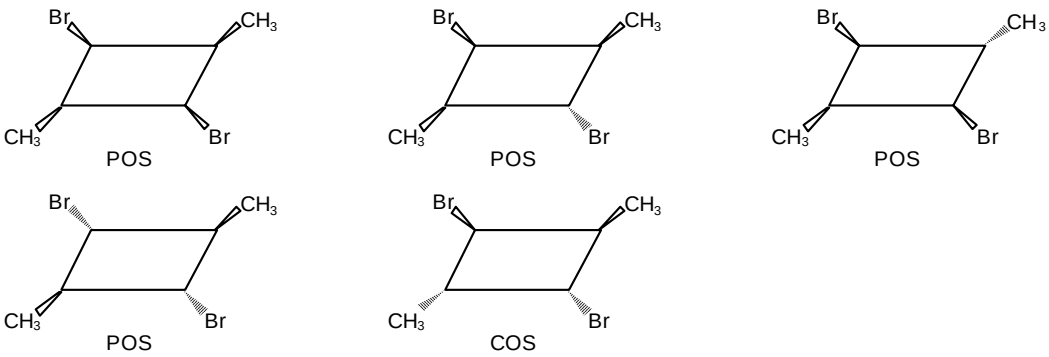


17. It is keto-enol tautomerisation reaction which involves recemisation in the product mixture.

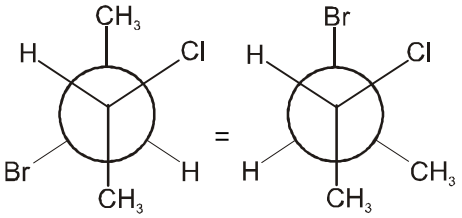
19.



20.

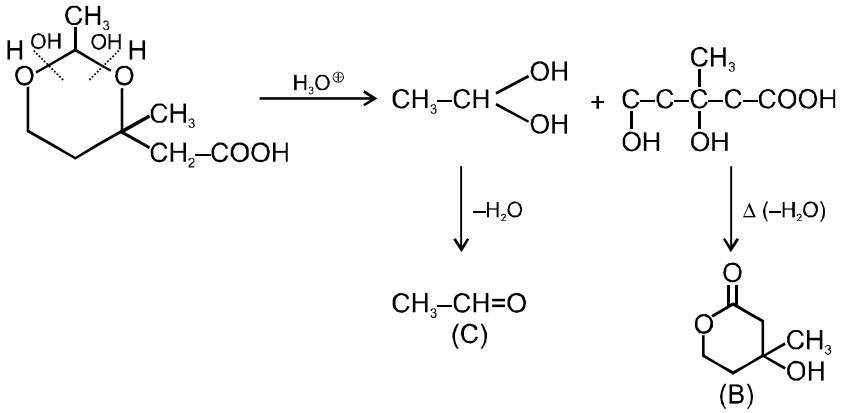


All of these are optically inactive.

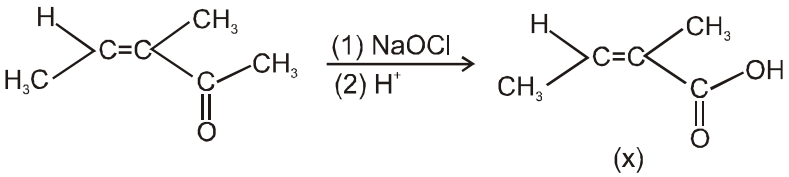
21. 

(B) (P)

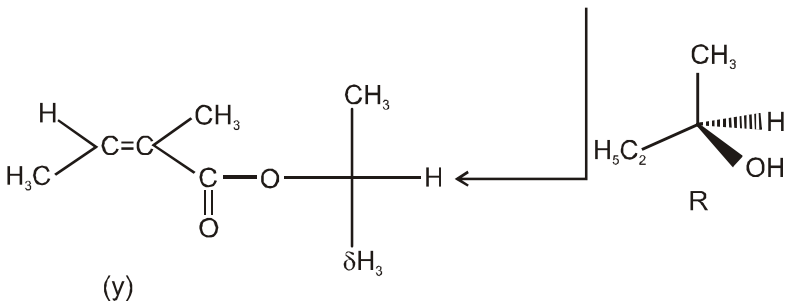
(P) is identical with (B).

30. 

33. All 5 stereoisomers are achiral.

35. 

(x)



(y)

no. of product is one.

38. 

40. X = 4 (i , iii , iv , vi) and Y = 2 (ii , vi) **;** Sum of X and Y = 4 + 2 = 6

41. 2M glyceraldehyde = 2 x 90 = 180 g/L = 0.18 g/ml

length of polarimeter tube = 100 mm = 10 cm = 1dm

α_{obs} = 7.2° ; $[\alpha]_D^T = \frac{7.2}{0.18 \times 1}$ **= +40°**