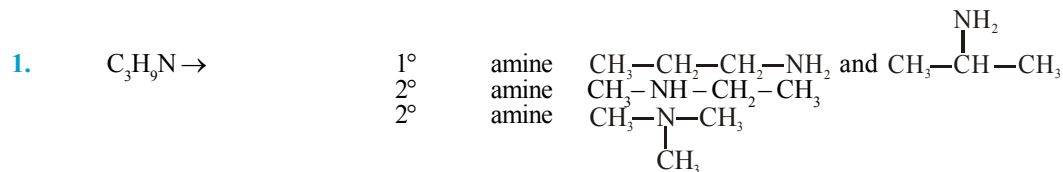


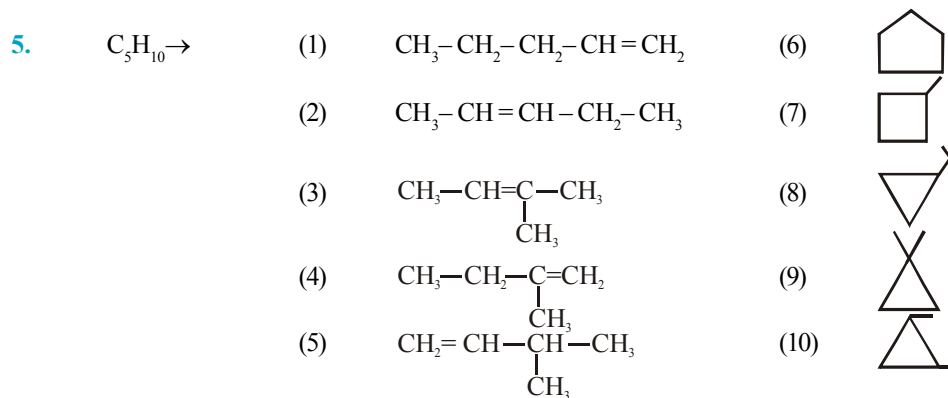
HINTS & SOLUTIONS

EXERCISE - 1

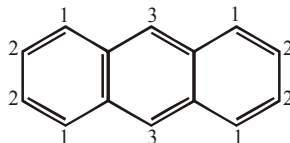
Single Choice



So C is correct option.

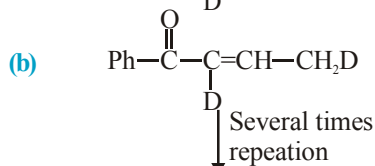
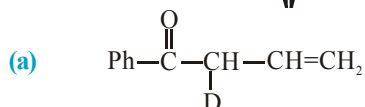
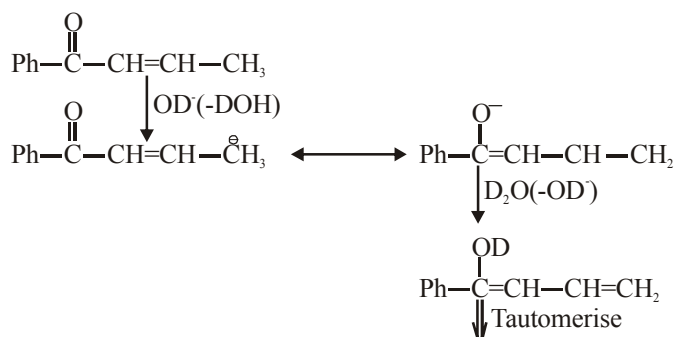


9. Anthracene

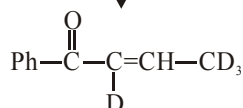


Only three types of hydrogen so only three structural isomers possible.

10.

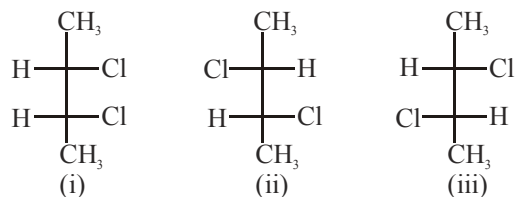
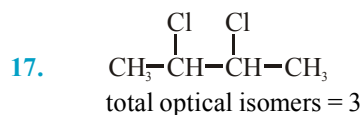
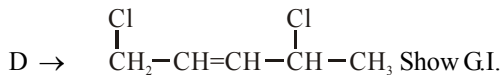
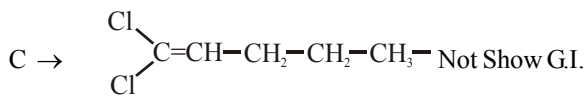
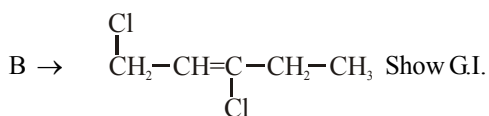
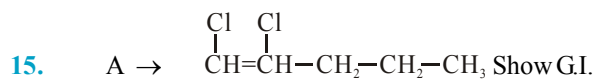
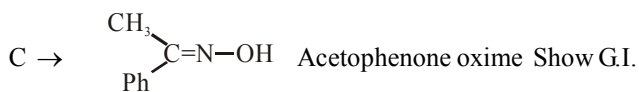
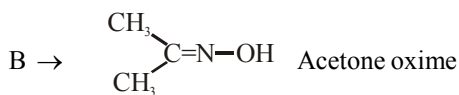
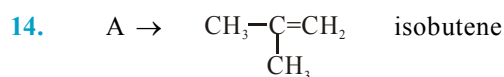
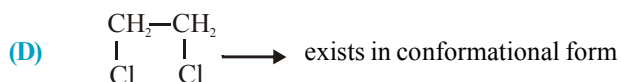
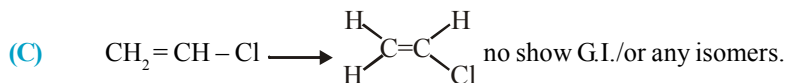
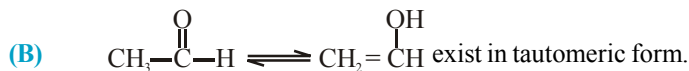
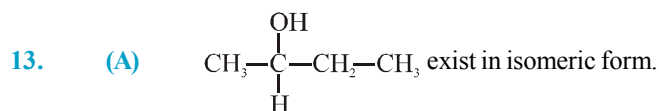


Product will be

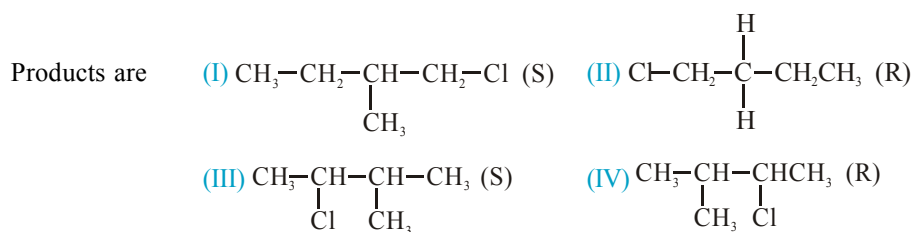
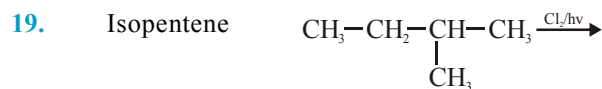


CHEMISTRY FOR JEE MAIN & ADVANCED

11. Ethene \rightarrow $\text{CH}_2 = \text{CH}_2$ Cannot show G.I.
 Propene \rightarrow $\text{CH}_3 - \text{CH} = \text{CH}_2$ Cannot show G.I.
 Butene \rightarrow $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_3$ Show G.I. and it also show positional isomerism.
 $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH}_2$ and $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_3$

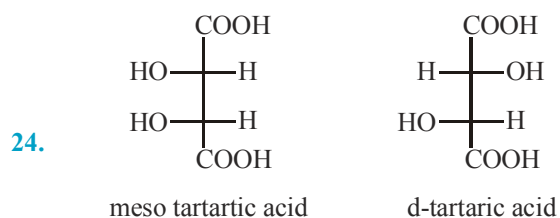


(II) and (III) are optically active.

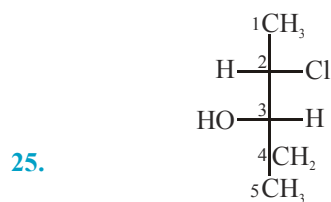


Only (1) and (3) are optically active.

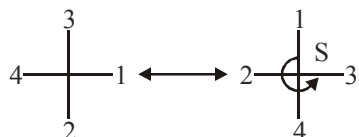
20. A → Planar compound so optically inactive.
 B → Non planar and optically active due to absence of POS & COS.
 C → Non planer but having POS so, optically inactive.
 D → Planar compound



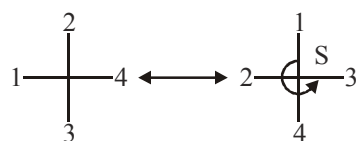
They are diastereomers.



R-S configuration of 2nd carbon



R-S configuration of 3rd carbon.



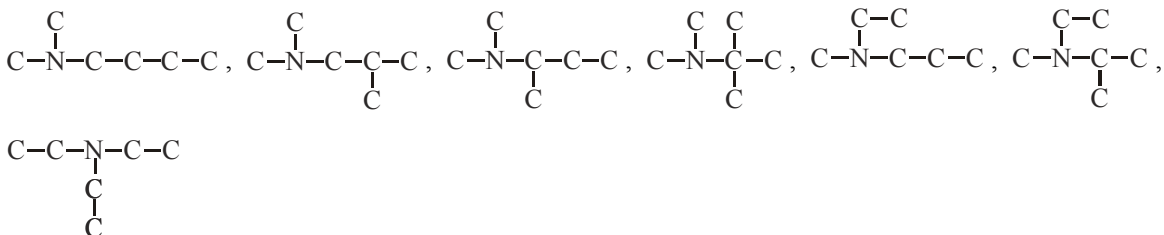
So option is (A)

27. Mirror image of D-ribose is known as L-form.

30.



31.

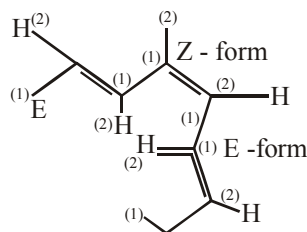
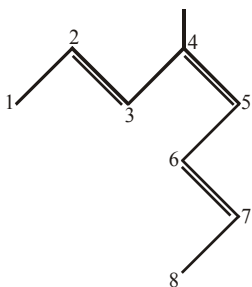


34.

Higher Priority groups same side \Rightarrow Z - form

Higher Priority groups opposite side \Rightarrow E - form

2nd and 6th carbon is in E-form while 4th carbon is in Z-form.

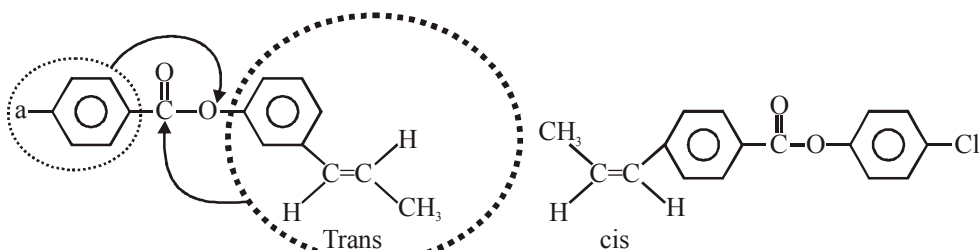


35.

Alkyl group is different.

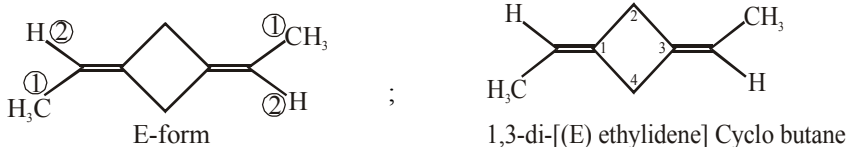
$\text{-C}(=\text{O})\text{-}$ is bivalent group which has different alkyl groups in both compounds.

As we know that according to definitions of metamerism "When alkyl group is different around bivalent, or trivalent atom 1 group compounds termed as metamers.



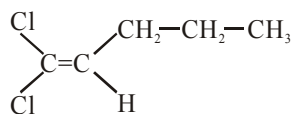
Although in second compound trans form is present but structure is also present so it will be metamers not geometrical isomers.

36.



Ring will be Principle carbon chain so we assign numbering for ethylidene group ($\text{CH}_3-\text{CH}=\text{C}<$) which is E-in configuration.

37. If terminal carbon have same group than it can show geometrical isomerism.



In this compound there is not possibility to show geometrical isomerism because at first double bonded carbon 2-same chlorine atom is attached.

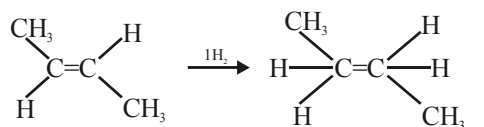
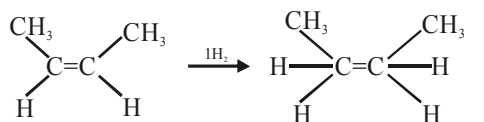
38. Both will give n-Butane as a product.

Boiling point cis-2-butene > Trans 2-butane

Dipole moment cis-2-butene > Trans 2-butane

Heat of Hydrogenation cis-2-butene > Trans 2-butane

Product same



same compounds

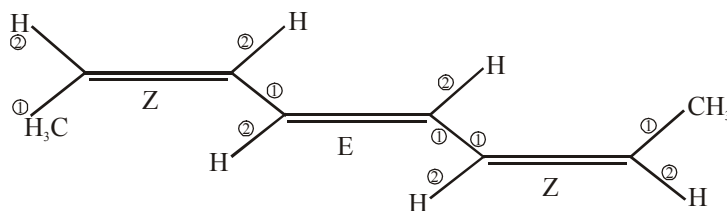
39. Higher Priority groups same side

= Z - form

Higher Priority groups oppsite side

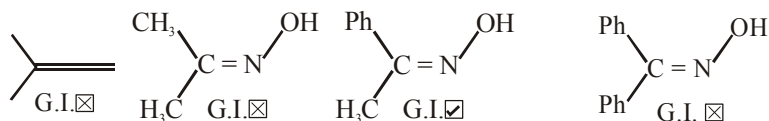
= E - form

CH₃ - group name more Priority than H - atom



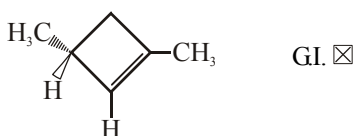
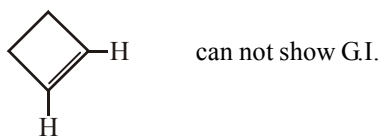
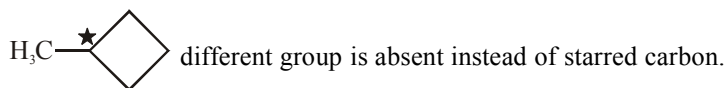
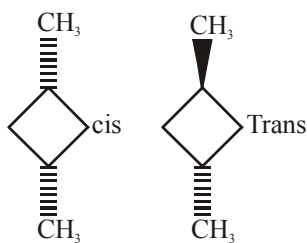
40. Lone pair also counts as a different group.

For G.I. for ground attached to the terminal carbon or Nitrogen must be different.

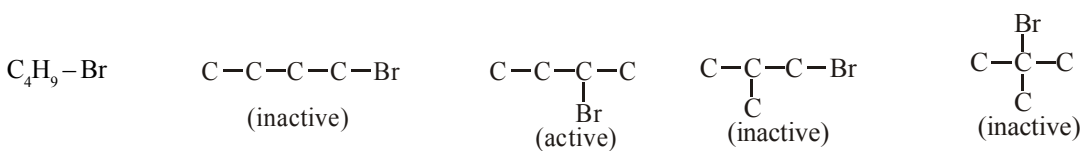
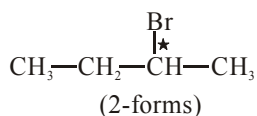


CHEMISTRY FOR JEE MAIN & ADVANCED

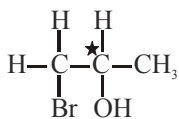
41. In cyclo alkane minimum 2 group & carbon ring required.



42. One chiral carbon Containing Compound always optially active.



43. Asymmetric carbon \equiv Chiral carbon.

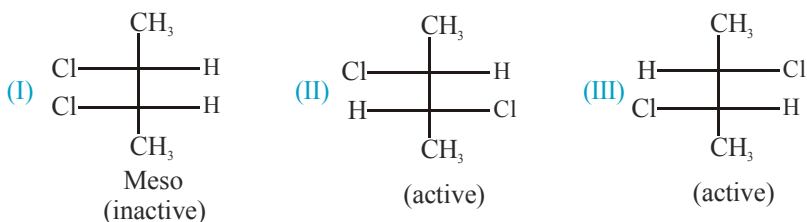


Tetrahedral (Tetravalent carbon) having four different group is known as chiral/Asymmetric carbon.

44. Compound having single chiral carbon always optically active and gives two active compound

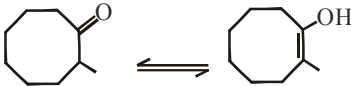
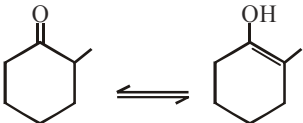


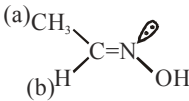
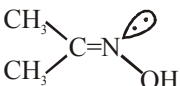
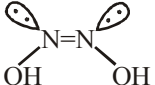
Where n = Number of chiral carbon

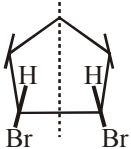
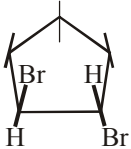
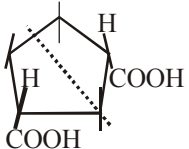
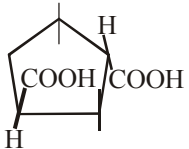


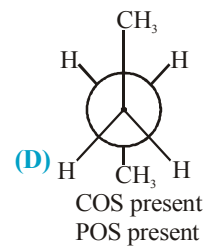
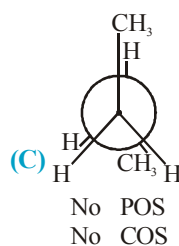
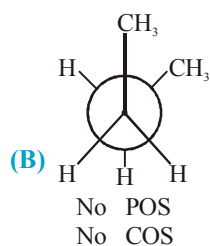
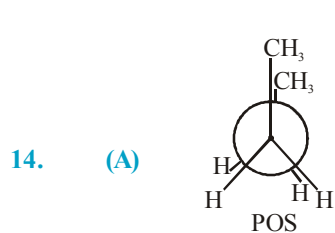
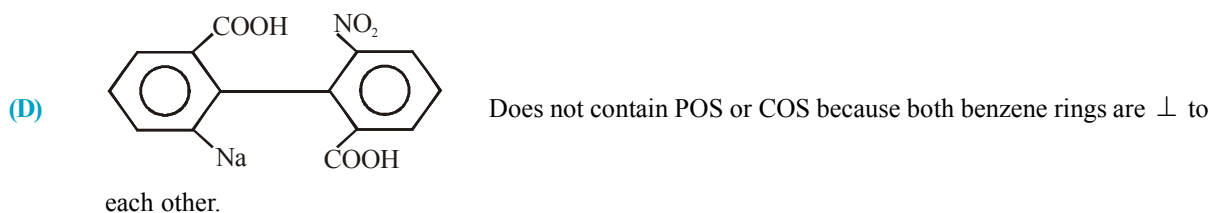
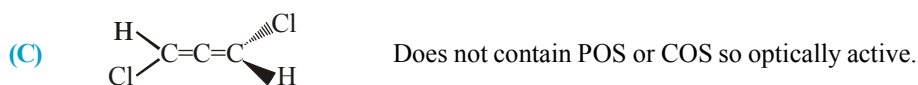
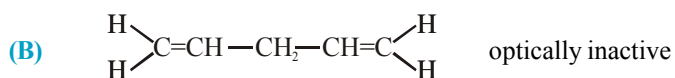
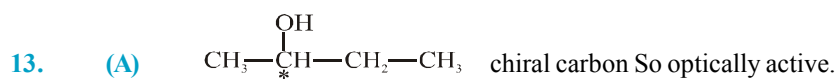
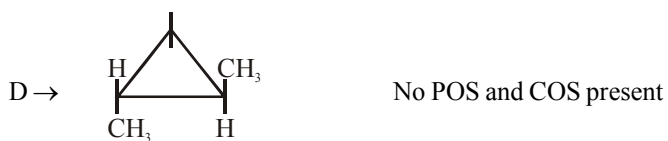
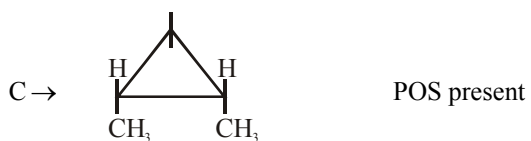
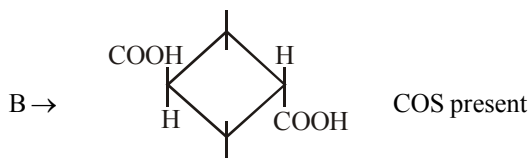
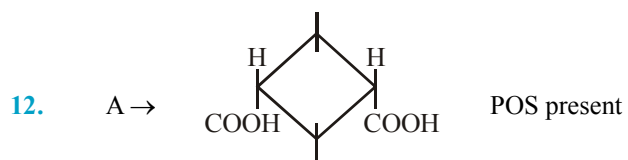
EXERCISE - 2

Part # I : Multiple Choice

5. (A) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{H} \rightleftharpoons \text{CH}_2=\overset{\text{OH}}{\text{C}}-\text{H}$ No G.I.
- (B) $\text{CH}_3-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{H} \rightleftharpoons \text{CH}_3-\text{CH}=\overset{\text{OH}}{\text{C}}-\text{H}$ Show G.I.
- (C)  Show G.I. due to ring contain 8-carob.
- (D)  No G.I.

8. (A)  Show G.I. (a not equal to b)
- (B) Show G.I.
- (C)  a = b so not show G.I.
- (D)  Show G.I.

11. (A)  POS present
- (B)  No POS & COS present
- (C)  POS present
- (D)  No POS and COS.



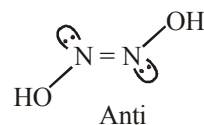
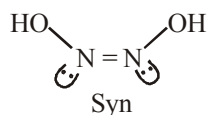
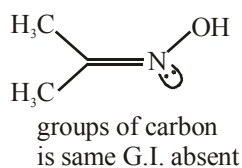
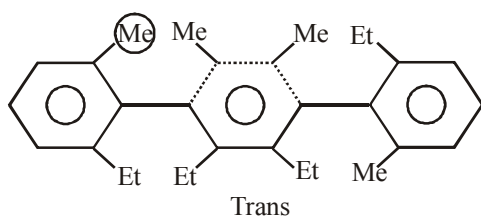
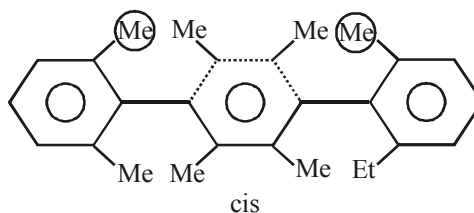
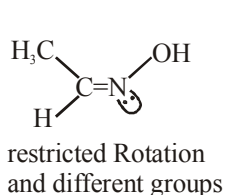
16. Same group same side Erythro and same group opposite side then.

18. In structural isomerism Connectivity of atoms remains same.

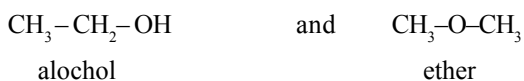
In tautomerism atom must oscillate in the compound.

Geometrical isomerism shown by many compounds like, alkene, cycloalkanes, oximes, etc.

19. Groups around the area which rotation has been restricted should be different.
Lone pair and isotopes also counts as a different groups.



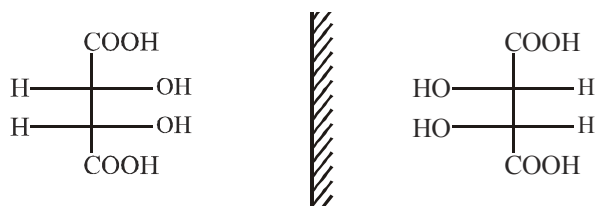
20. Single chiral carbon have two form dextrorotatory and laevorotatory.
Chiral carbon or Asymmetric carbon is always stereo centre.



Ether and alcohol are functional isomers.

21. POS or COS both present.

Meso is achiral compound having minimum two chiral carbon.



Super imposable
mirror image

We can superimposable it by
Rotation along the plane by 180°

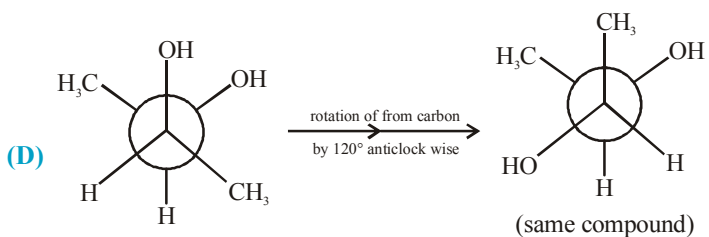
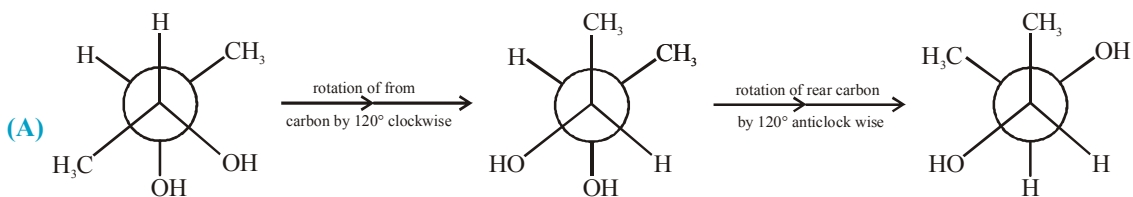
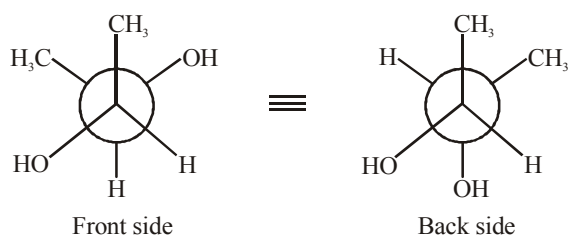
22. POS or COS may be present.

Meso are the compounds with was minimum 2-chiral carbon or more and having POS or COS or both.

Fro optical activity two necessary condition us compound must be asymmetric. It POS or COS present then it will super impose on its mirror image.

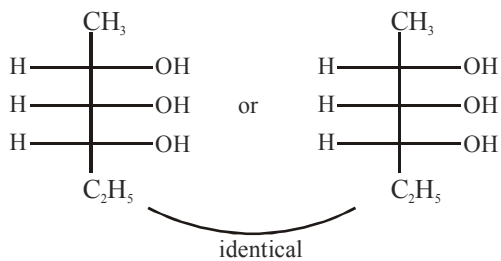
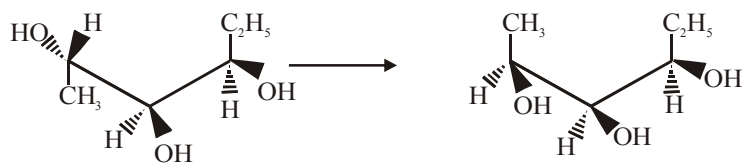
CHEMISTRY FOR JEE MAIN & ADVANCED

23. Check conformers of the compounds

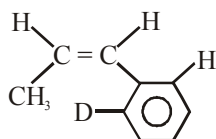
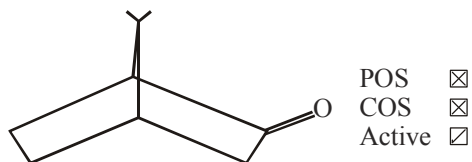


24. Check R/S configuration

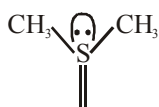
Fischer is in eclipse form so first we have to convert above compound into total eclipsed form.



25. Optically active compound will be resolvable.
Resolution is a process by we separate entiomers and we know that entiomers are individually active so check POS and COS.



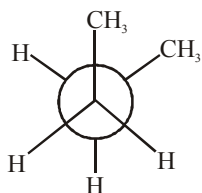
Planer molecular
Molecular POS
(Inactive)



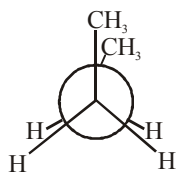
sp^3 - Sulphur
Non - Planer
POS x COS x (Resolvable)

26. Two different group – H and –CH₃ is present.

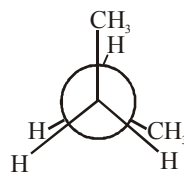
When two groups (Bulky) are at 60° Dihedral angle is known as sancle form



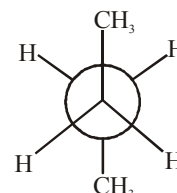
POS
COS
Active



POS
COS
Active



POS
COS
Active



POS
COS
Active

Part # II : Assertion & Reason

3. Me – C≡N and Me – N⁻ = C are functional isomers but H – C≡N and H – N⁻ are Tautomer
4. The enol form of 5,5- dimethyl-1,3- cyclohexanedione is stable due to chelation, but same is not true in 2,2-dimethyl 1,3-cyclohexanedione dur to absence of α-hydrogen because it is not having more acidic hydrogen.

EXERCISE - 3

Part # II : Comprehension

Comprehension # 4 :

1. [Specific rotation of (-) MSG]

$$C = \frac{169 \text{ gm}}{845 \text{ gm}} \quad l = 2 \text{ dm}$$

$$[\theta^\circ] = \frac{\theta}{Cl} = \frac{9.6}{169/845 \times 2} = -24^\circ$$

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2. Optical of purity $(-)$ MSG = $\frac{\theta_{\text{Observed}}}{\theta_{\text{Standard}}} \times 100 = 83.33\%$

RM = 100 – optical of purity
= 100 – 83.33 = 16.66%

$(-)$ MSG total in mixture \Rightarrow

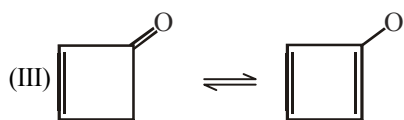
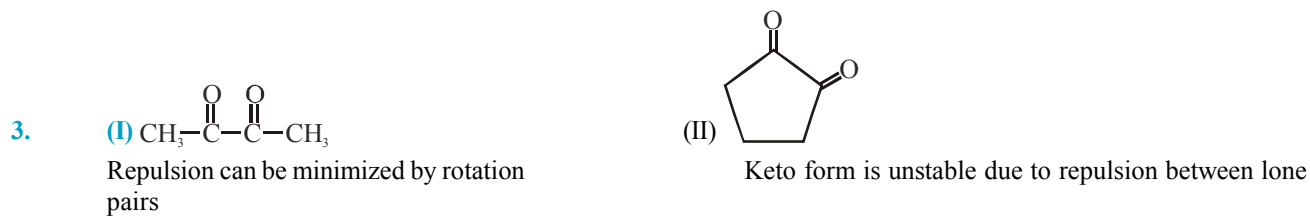
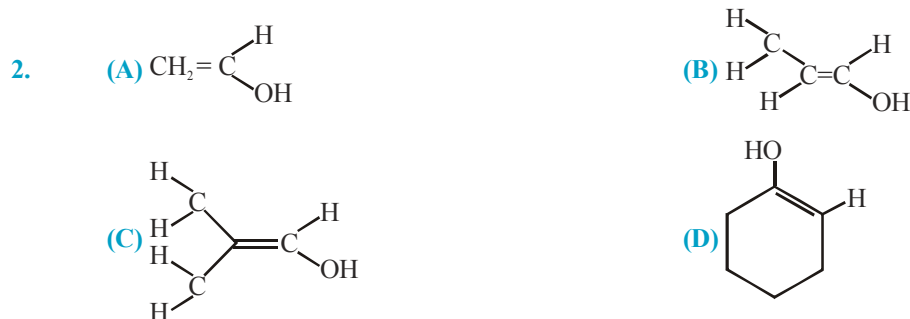
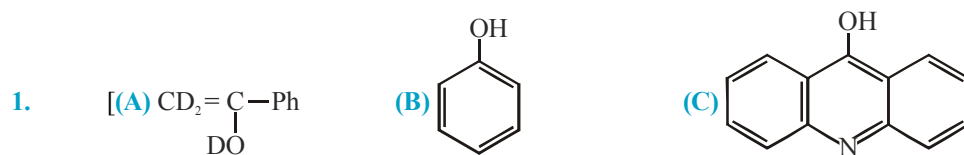
83.33%
+ 8.33%
<hr style="width: 50px; margin: 0;"/> 91.66%

3. $(+)$ MSG \Rightarrow 33.8 gm in 338 ml
 $(-)$ MSG \Rightarrow 16.9 gm in 169 ml
 Optical purity in mixture $(+)$ MSG = 16.9 gm in 507 ml solution

$C = \frac{16.9}{507} \text{ gm/ml}$ $l = 4 \text{ dm}$

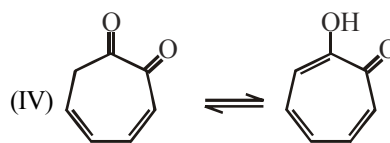
$\theta_{\text{Observed}} = [\theta^\circ] \times C \cdot l$ $= 24 \times \frac{16.9}{507} \times 4 = +3.2\%$

Comprehension # 5 :



Antiaromatic

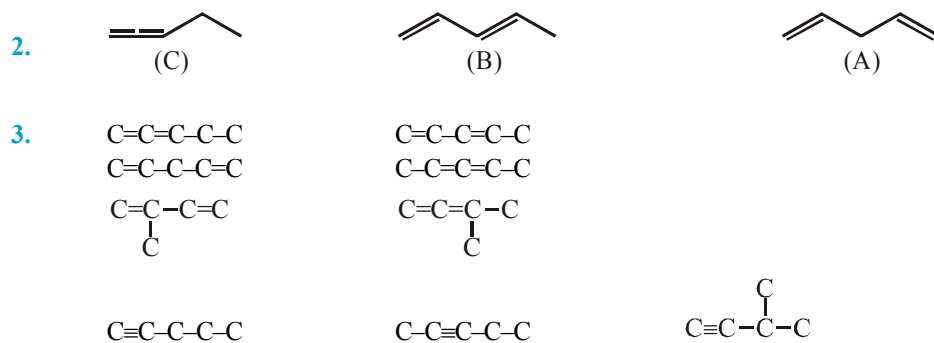
When tautomerize enol is antiaromatic while



Aromatic

When tautomerize enol is aromatic so IV prefers to be in enol form

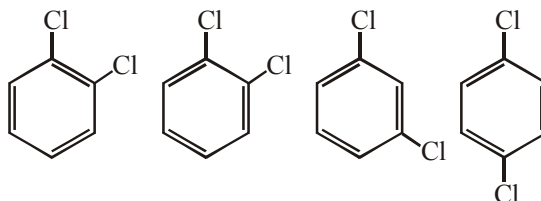
Comprehension # 6 :




EXERCISE - 4

Subjective Type

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

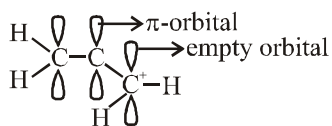


3. There are 7. 1-butanol, 2-butanol, 2-methyl-1-propanol, 2-methyl-2-propanol, diethyl ether, methyl propyl ether, and methylisopropyl ether.

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

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

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



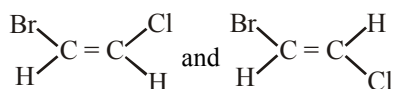
In n-propyl cation, + I effect of R increases the stability.

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

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

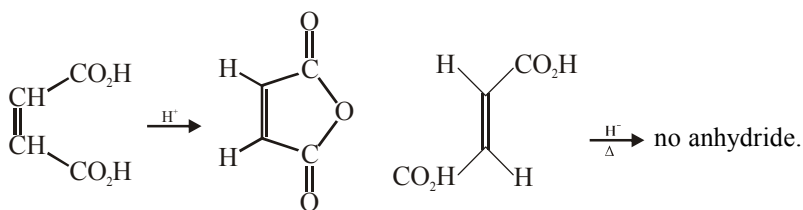
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6. Only $\text{CHBr}=\text{CHCl}$ can exist as geometric isomers :



In $\text{CH}_2\text{Cl}-\text{CH}_2\text{Cl}$ and $\text{CH}_2\text{Cl}-\text{CH}_2\text{Br}$, the carbon atoms are connected by a single bond about which the groups can rotate relatively freely. Thus any conformation of the halogen atoms may be converted into any other simply by rotation about the single bond. In CH_2Cl_2 , the configuration of the molecule is tetrahedral and all interchanges of atoms yield exactly equivalent configurations.

7. Maleic acid forms an anhydride whereas fumaric acid does not.



8. Lone pair - $p\pi$ conjugation between fluorine and carbon will be more effective than between chlorine and carbon.

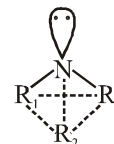
9. $\text{III} > \text{IV} > \text{I} > \text{II}$

11. (A) $-\text{Br} > -\text{CH}_2\text{CH}_2\text{OH} > -\text{CH}_2\text{CH}_3 > -\text{H}$,
 (B) $-\text{OH} > -\text{COOCH}_3 > -\text{COOH} > -\text{CH}_2\text{OH}$
 (C) $-\text{NH}_2 > -\text{CN} > -\text{CH}_2\text{NHCH}_3 > -\text{CH}_2\text{NH}_2$
 (D) $-\text{Br} > -\text{Cl} > -\text{CH}_2\text{Br} > -\text{CH}_2\text{Cl}$

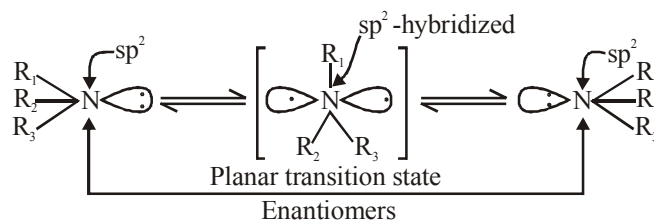
12. Tertiary amines have pyramidal geometry with sp^3 hybridization at nitrogen.

It should be a chiral molecule (assuming lone pair to be a substituent).

Thus, tertiary amines exist as racemic mixture but they cannot be resolved.



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



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

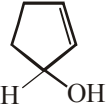
13. $\text{CH}_2=\text{CH}-\text{N}(\text{H})\text{CH}_3$
 $\text{CH}_2-\text{CH}=\text{N}(\text{H})\text{CH}_3$ (this shows Geometrical isomerism)

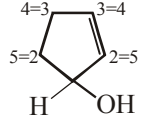
15. a & b are tautomers and a & c are resonating structures.

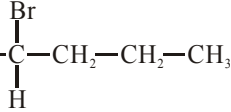
16. Let x is the % of (+) 2-butanol.

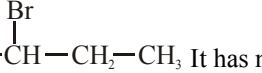
$$13.9x - 13.9(100 - x) = -300.$$

$$x = 39.2, \text{ \% of d form} = 39.2, \text{ \% of l form} = 60.8.$$

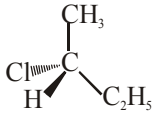
17. (i)  Hydroxyl bearing carbon is stereogenic centre,

(ii)  It has no stereogenic centre.

(iii)  bromine bearing carbon is stereogenic centre.

(iv)  It has no stereogenic centre.

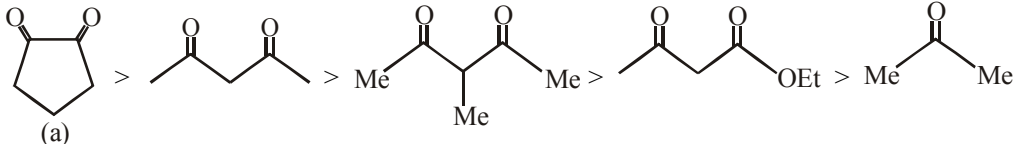
18. (i) 2R, 3R (ii) 2S, 3R

19. 

21. (A) Positional (B) Functional (C) Metamerism (D) Positional (E) Functional (F) Tautomerism

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

23. (A) 2; (B) 2

24. 

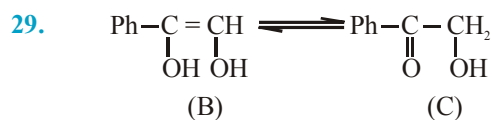
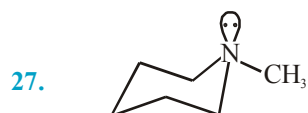
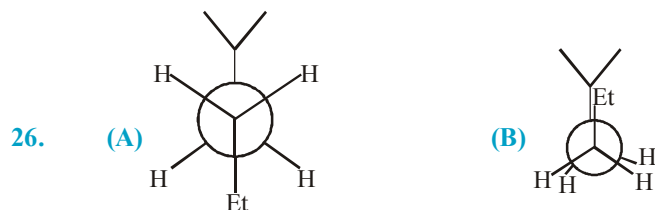
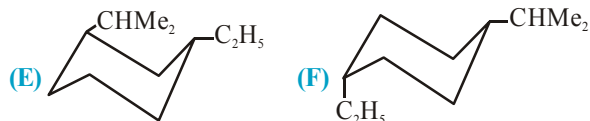
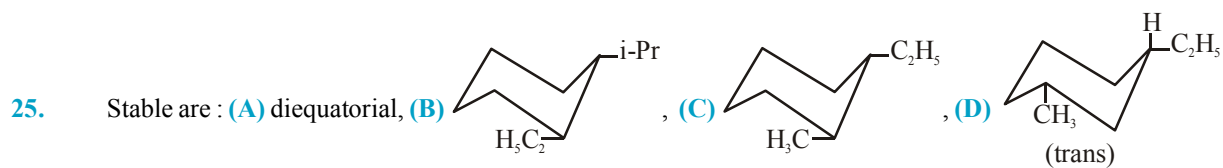
(A) Tightly on stable keto due to repulsion between α -CO groups has 100% enol. >

(B) Active 'H' atom/Acidic 'H' atom so has more enolic content (enol stabilise by resonance & Intra molecular H-bonding) >

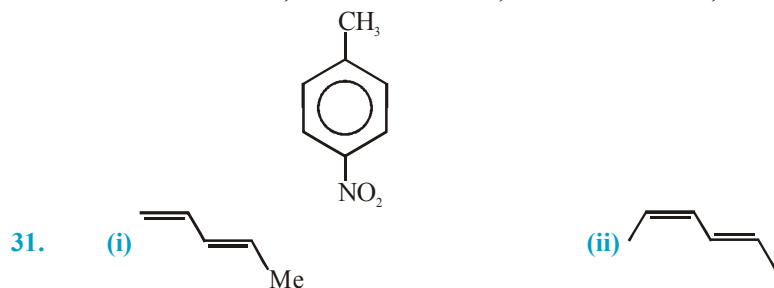
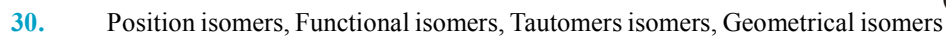
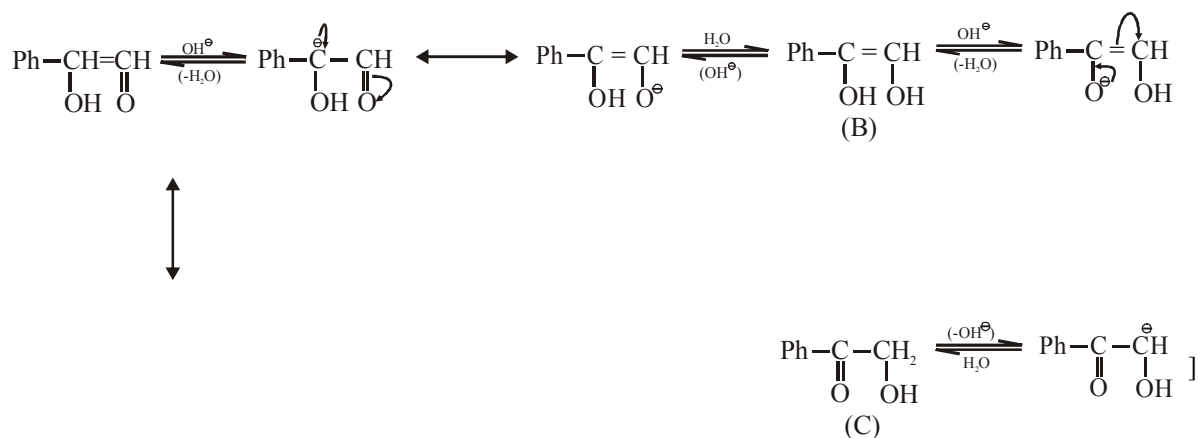
(C) Enolic contents decreases with introduction of e^- donator group which causes repulsion in enolic form.

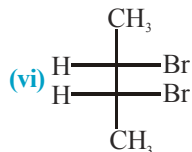
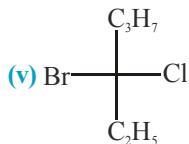
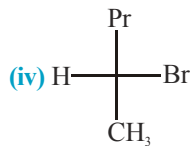
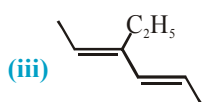
(D) Due to ester group acidic structure of active H decreases & C=C of enol undergoes cross resonance >

(E) Lowest enolic content because >C=O is more stable than >C=C< bond]

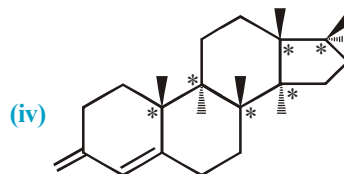
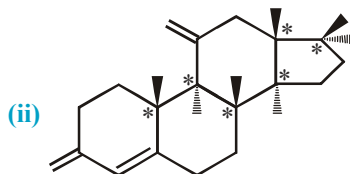
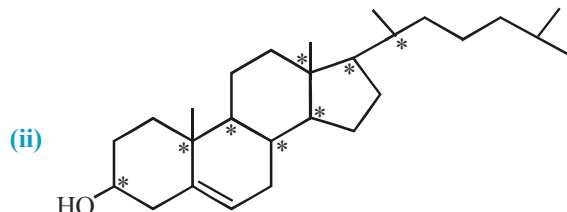
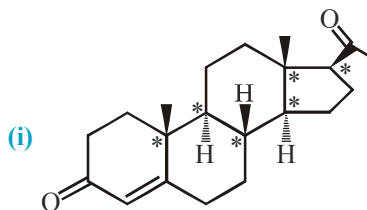


(Mechanism)





32. (i) 6, (ii) 8, (iii) 6, (iv) 6

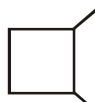


33. (A) 4, 1, 2, 3, (B) 4, 1, 2, 3, (C) 1, 3, 2, 4, (D) 4, 3, 2, 1, (E) 2, 4, 3, 1, (F) 4, 2, 3, 1 (G) 3, 1, 4, 2 (H) 2, 4, 1, 3 (I) 3, 2, 1, 4 (J) 2, 1, 4, 3

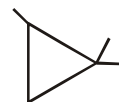
34. 8



4 Optically active isomers



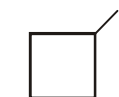
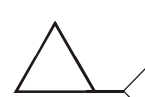
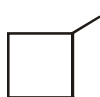
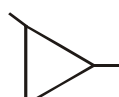
2 Optically active



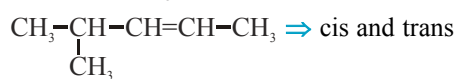
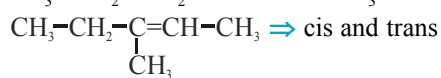
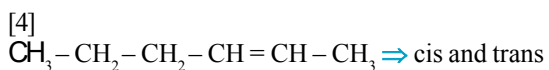
2 Optically active

$$2 + 2 + 4 = 8$$

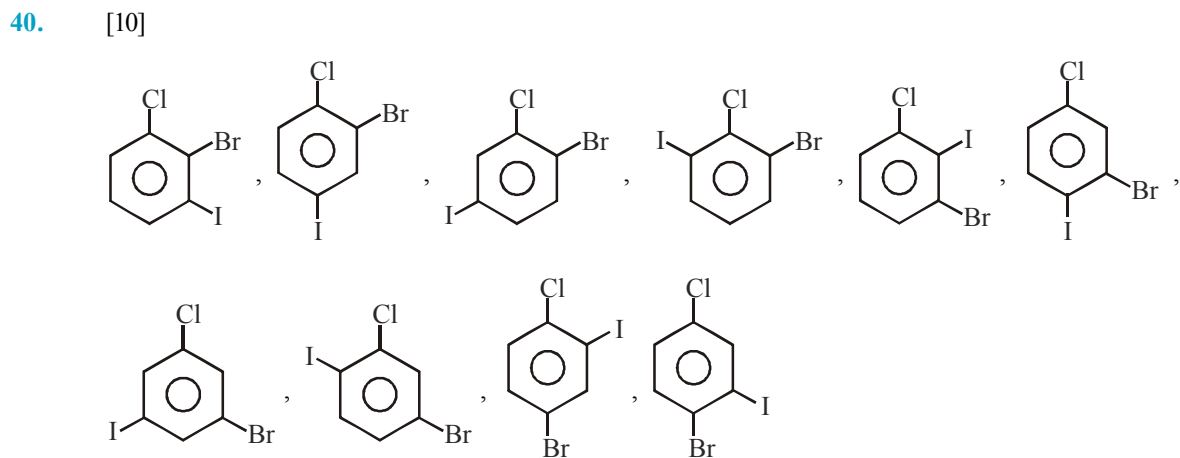
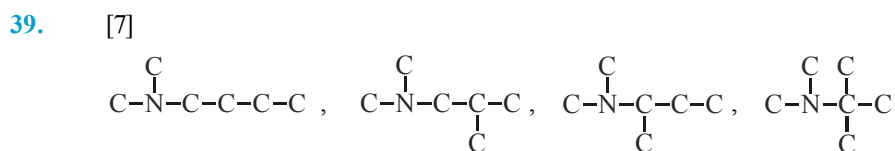
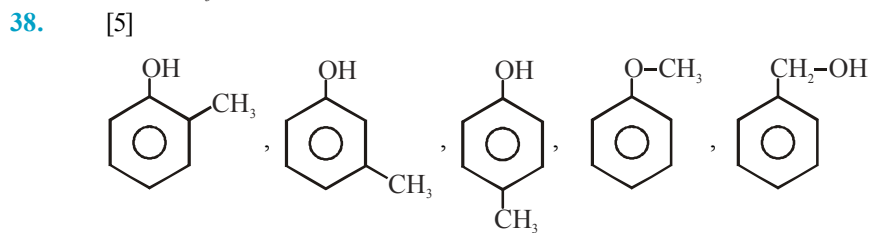
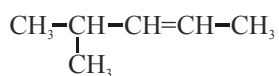
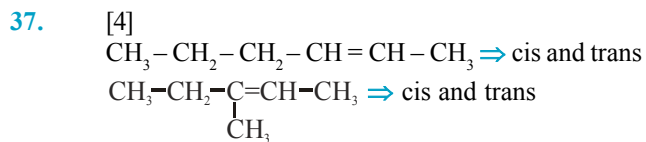
35. 12



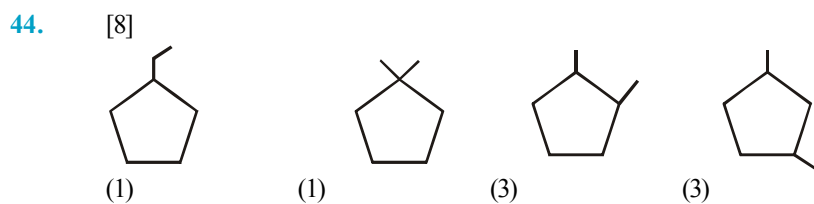
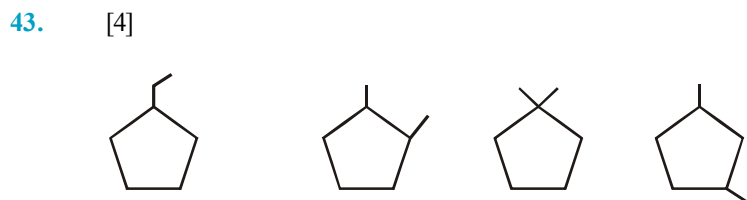
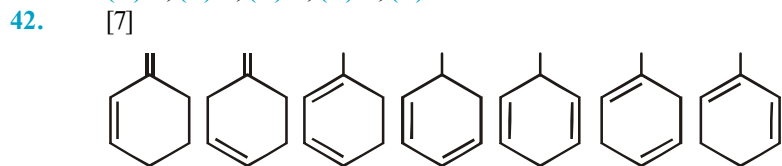
36. [4]



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41. (A) 1; (B) 1; (C) 1; (D) 1; (E) 1



45. (A) [4 > 1 > 3 > 2], (B) [3 > 1 > 4 > 2]

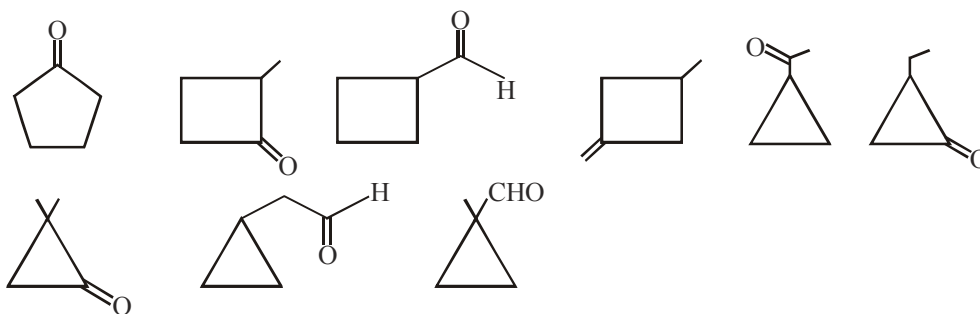
47. [(A) 3 > 1 > 2; (B) 4 > 2 > 1 > 3]

49. [3 > 1 > 2]

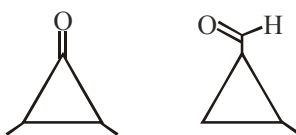
50. [9]

Explanation :

Those isomers which can't show GI.



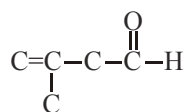
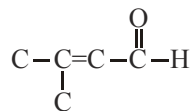
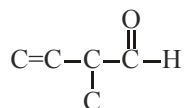
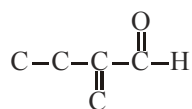
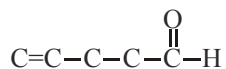
Those isomers which can show GI.



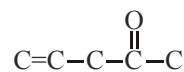
51. [8]

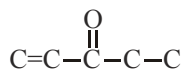
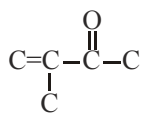
Explanation :

Those isomer which can't show G.I.

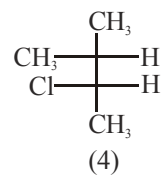
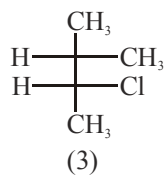
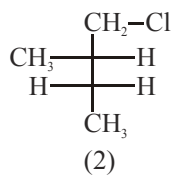
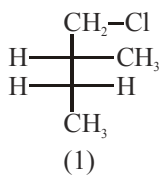


Those isomers which can show GI.

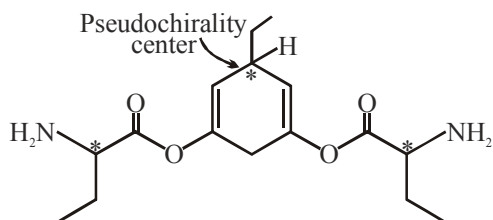




52. [4]



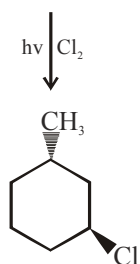
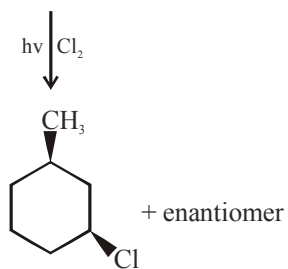
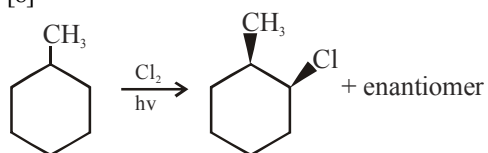
53. [3, 1]



R
S
R

R
S
S

54. [8]



55. [3]

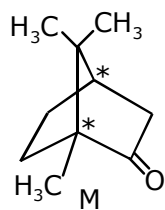
EXERCISE - 5

Part # I : AIEEE/JEE-MAIN

17. $\text{H}_3\text{C}-\text{HC}=\text{CH}-\text{CH}_2-\text{Ph}$
Both double bonded carbon are differently disubstituted.

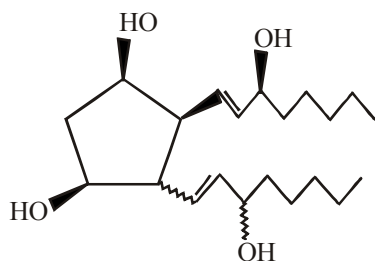
Part # II : IIT-JEE ADVANCED

18. Molecule is unsymmetrical
 $n = 2$



Total stereoisomers = $2^n = 2^2 = 4$

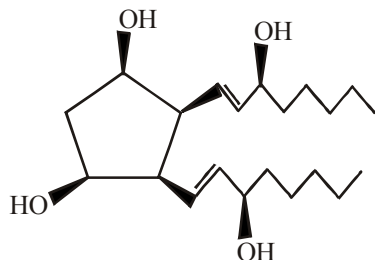
- 19.



Only three stereocentre are present.

\therefore Total isomer = $2^3 = 8$

But one is optically inactive. (Meso compound)



So optically active = $8 - 1 = 7$