

Chemistry Question Bank

Career Endeavor - Chem Academy - Saraswati Dham

CSIR-UGC NET-JRF Chemistry

IIT-JAM Chemistry

Chemistry - A Free Initiative for Study Material

1. Chemistry People

<https://kutumb.app/chemistry-group?ref=ODB82>

2. CSIR NET-JRF CHEMISTRY

<https://kutumb.app/c-s-i-r-j-r-f-c?ref=TRYN4>

3. CSIR NET-GATE JAM Chemistry

<https://kutumb.app/c-n-g-j-c?ref=TRYN4>

4. Gate Chemistry

<https://kutumb.app/gate-chemistry?ref=TRYN4>

5. IIT-JAM Chemistry

<https://kutumbapp.page.link/5xEADxvTyi2CgEPY9>

6. Target NEET/IIT-JEE (NTA) Chemistry

<https://kutumbapp.page.link/fgsPekDYfKHvvSgG7>

7. Target UPSC - Free Study Material

<https://kutumb.app/target-upsc-fsm?ref=TRYN4>

8. Global Teacher Association

<https://kutumb.app/Global-Teachers-Association?ref=ODB82>

9. College Students Association

<https://kutumb.app/csa?ref=ODB82>

10. Indian Research Scholar Association

<https://kutumb.app/i-r-s-a?ref=ODB82>

11. Government Job Alerts

<https://kutumb.app/government-job-alerts?ref=ODB82>

S.P. Sharma

ORGANIC CHEMISTRY

VOLUME - 1

IIT-JAM

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CH

Rules 1

(a)

(b)

(c)

(d)

Stabilit

AROM

Aroma

1.

2.

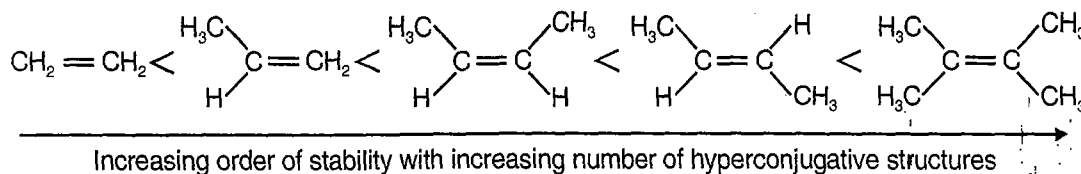
3.

GENERAL ORGANIC
CHEMISTRY

Rules for writing Resonating Structures

- (a) All resonating structures must be valid Lewis structure, *i.e.*, a carbon, N or O can't be pentavalent. H can't be divalent etc.
- (b) Positions of atomic nuclei and s -electrons remain constant. Resonance is all about π -electron delocalization, therefore position of π -electrons and non-bonding electrons may change in various resonating states.
- Invalid resonance states for benzene because distance between two carbon atoms are changing in these structures.
- (c) All the resonating structures must have same number of unpaired electrons (*i.e.*, $\Delta n = 0$)
- (d) For the effective overlap of p -orbitals part of the molecule taking part in resonance must be planar.

Stability of alkenes can be explained by hyperconjugative effect.



AROMATICITY

Aromaticity: Its explain the extra stability of cyclic molecule.

- It do not give unsaturation test like Baeyer's reagent test and bromine water test.
- It do not give electrophilic addition reaction.
- It contains diamagnetic ring current.
- It shows electrophilic substitution reactions.

Aromatic Character: [The Hückel $(4n + 2)\pi$ rule]

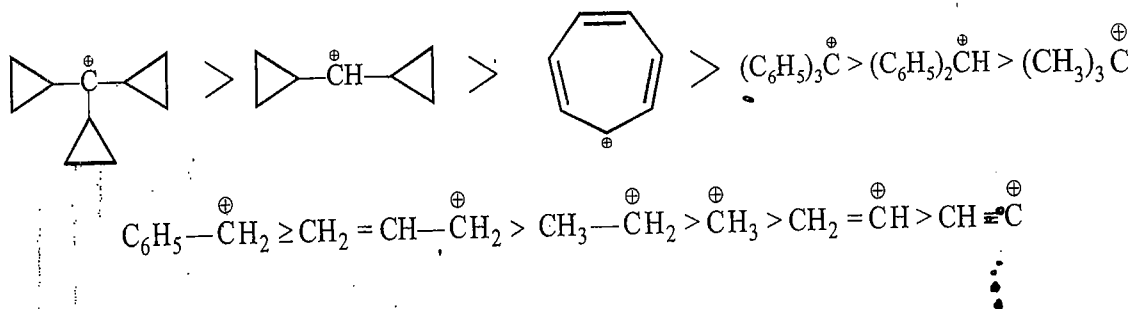
The following three rules are useful in predicting whether a particular compound is aromatic or non-aromatic.

1. Aromatic compounds are cyclic and planar.
2. Each atom in an aromatic ring is sp^2 hybridized.
3. The cyclic π molecular orbital (formed by overlap of p -orbital) must contain $(4n + 2)\pi$ electrons,

i.e., $2, 6, 10, 14 \dots \pi$ electrons. Where $n =$ an integer $0, 1, 2, 3, \dots$

Relative Stability of different Carbocation

Stability of different types of carbocations in decreasing order



EXERCISE - I

Single Correct Type

Inductive Effect

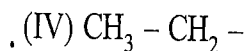
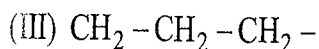
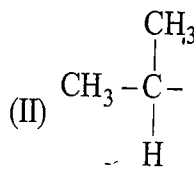
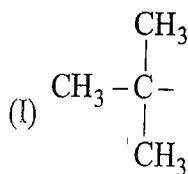
1. Correct order of strength of +I effect

- (I) $-\text{CH}_3$ (II) CD_3 (III) $-\text{CT}_3$ (IV) $-\text{CHD}_2$
(a) $\text{I} > \text{II} > \text{III} > \text{IV}$ (b) $\text{I} > \text{IV} > \text{II} > \text{III}$ (c) $\text{I} > \text{III} > \text{II} > \text{IV}$ (d) $\text{III} > \text{II} > \text{IV} > \text{I}$

2. Group which can show -I effect

- (a) $-\text{O}^-$ (b) $-\text{OH}$ (c) $-\text{CH}_3$ (d) $-\text{NH}^\oplus$

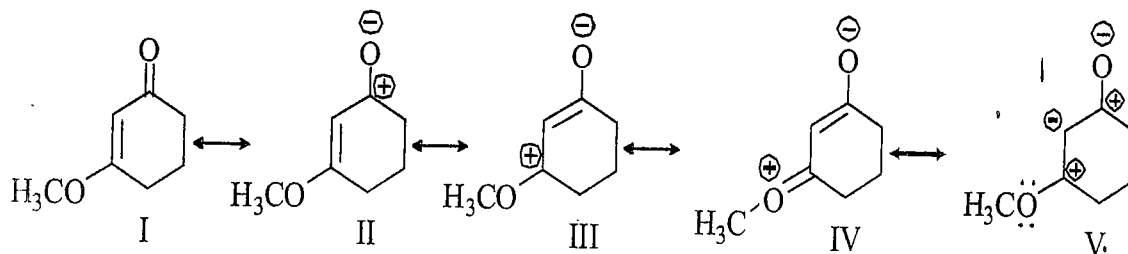
3. Correct order of +I strength



- (a) $\text{I} > \text{II} > \text{III} > \text{IV}$ (b) $\text{I} > \text{III} > \text{II} > \text{IV}$ (c) $\text{I} > \text{III} > \text{II} > \text{IV}$ (d) $\text{IV} > \text{III} > \text{II} > \text{I}$

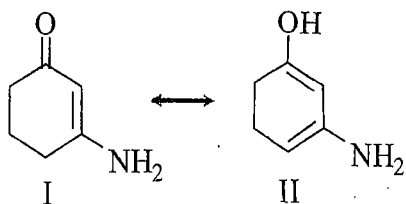
Resonance & Mesomeric Effect

4. Correct order of stability of resonating structure.



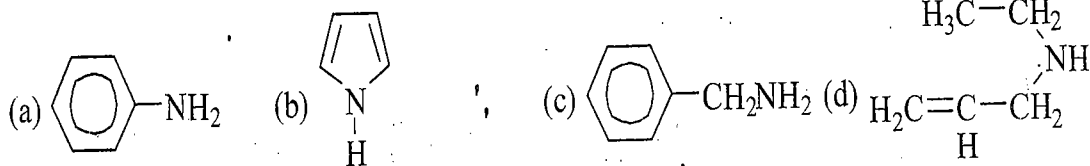
- (a) $\text{I} > \text{II} > \text{III} > \text{IV} > \text{V}$ (b) $\text{I} > \text{IV} > \text{II} > \text{III} > \text{V}$
(c) $\text{V} > \text{I} > \text{II} > \text{III} > \text{IV}$ (d) $\text{I} > \text{II} > \text{IV} > \text{III} > \text{V}$

5. Correct statement about this

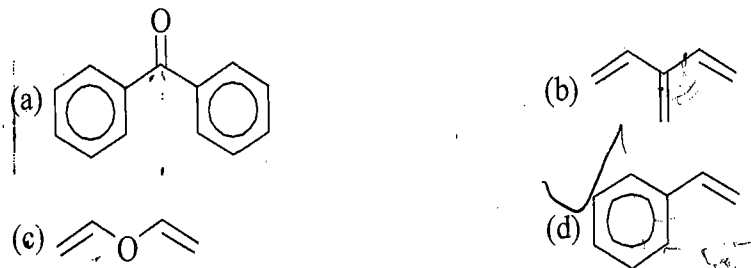


- (a) I and II are resonating structures (b) I and II have 4 sp^2 atoms
(c) I, II are different compound (d) I have 4 sp^2 atoms and II have sp^2 atoms.

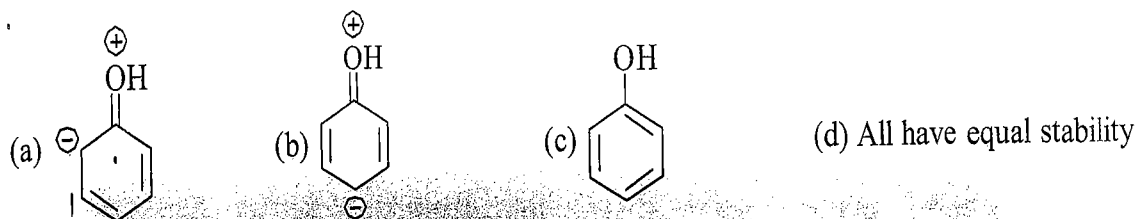
6. Which of the following compounds have no delocalized electron



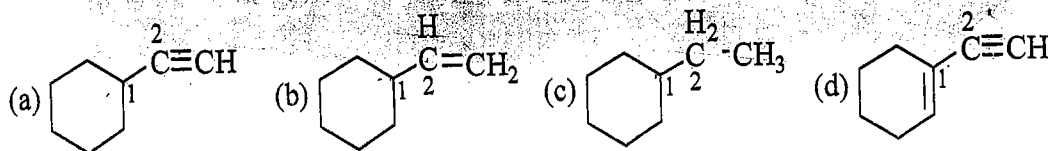
Which of the following is not example of cross-conjugation



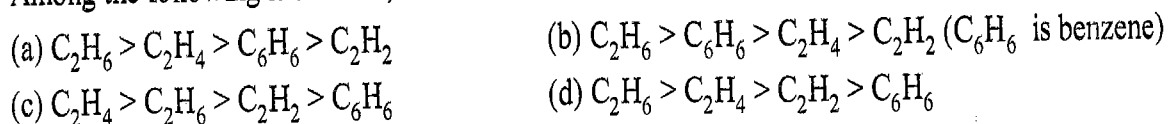
8. For phenol which of the following resonating structure is the most stable?



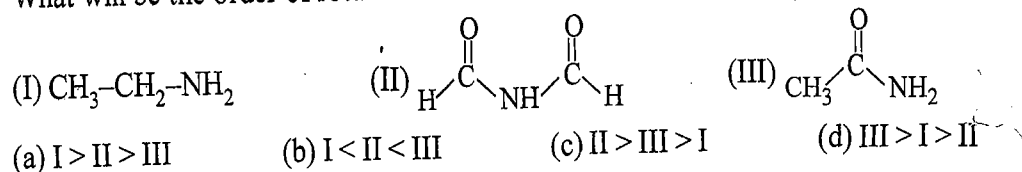
9. C1 - C2 bond is shortest in



10. Among the following molecules, the correct order of C - C length is

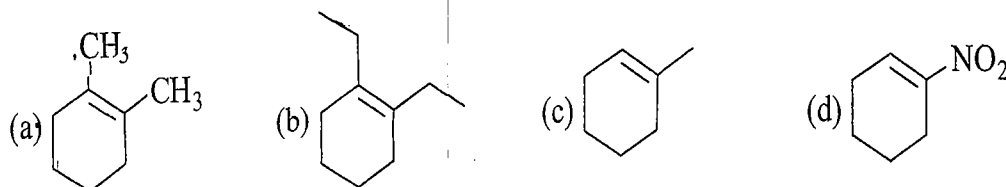


11. What will be the order of rotation barriers about C-N bond among these compounds?

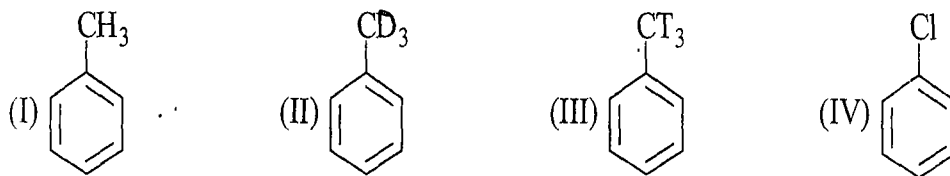


Hyperconjugation

12. Most electron rich alkene among the following is



(13) Correct order of electron rich benzene ring



(a) IV > I > II > III (b) IV > II > III > I (c) I > II > III > IV (d) IV > III > II > I

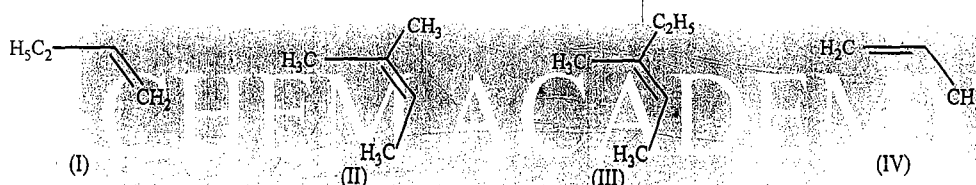
14. Among the following pairs in which case the second compound has higher heat of hydrogenation.



15. Which one of the following has the smallest heat of hydrogenation ?

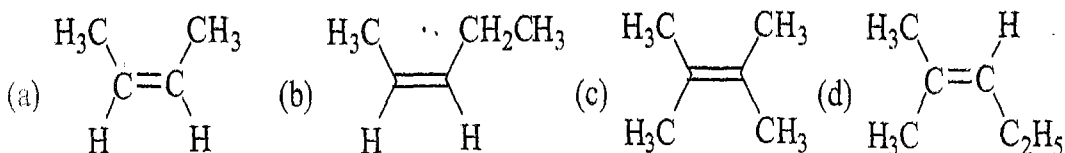
(a) 1-Butene (b) trans-2-Butene (c) cis-2-Butene (d) 1,3-Butadiene

16. Write the decreasing order of reactivity towards electrophilic addition.

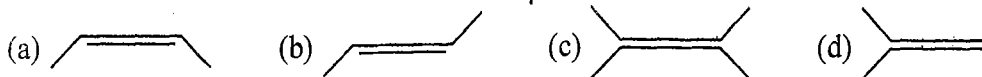


(a) II > III > IV > I (b) III > II > I > IV (c) I > II > III > IV (d) III > I > II > IV

17. Which of the alkene has least heat of hydrogenation

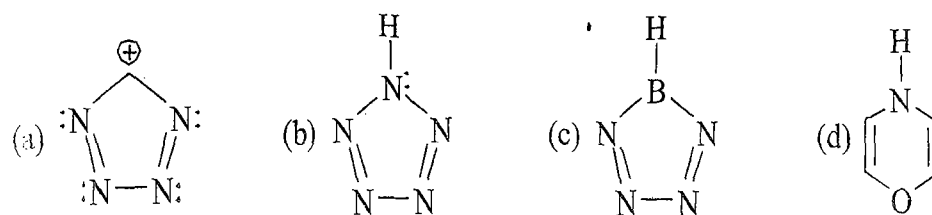


18. Which has least heat of hydrogenation -

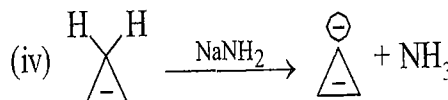
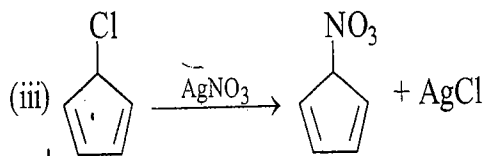
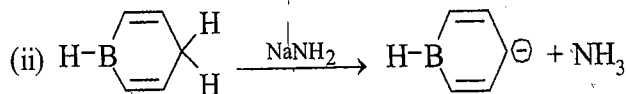
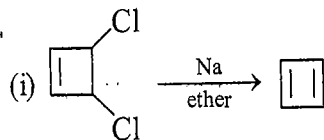


Aromaticity

19. Compounds which are aromatic



20. Reaction which will not possible



iii, iv

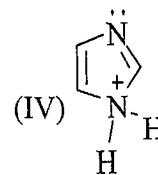
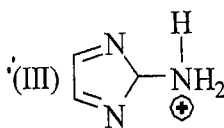
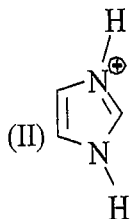
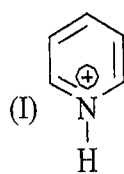
(a) iii, iv

(b) Only i

(c) Only iv

(d) All

21. Compound which are aromatic



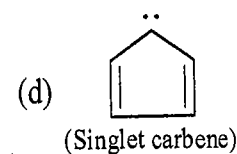
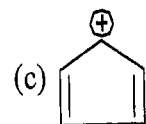
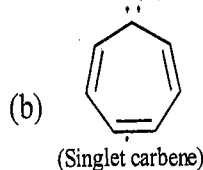
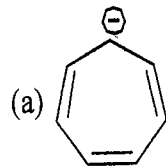
(a) I, II, III

(b) I and II

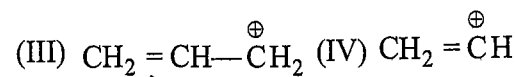
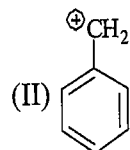
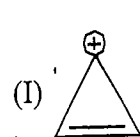
(c) III

(d) Only I

22. Which of the following is aromatic.



23. Correct order of stability of carbocation given below is :



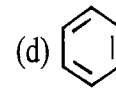
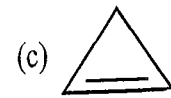
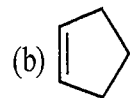
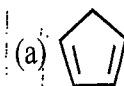
(a) II > III > I > IV

(b) I > II > III > IV

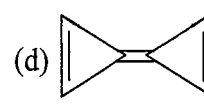
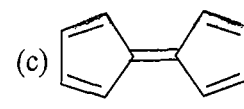
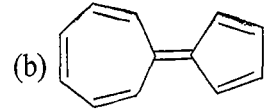
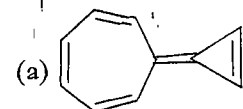
(c) II > I > III > IV

(d) I > III > II > IV

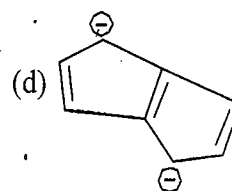
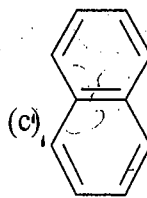
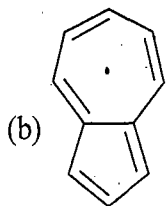
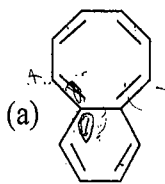
24. Which of the following hydrocarbon is most acidic?



25. Which of the following molecule is expected to have the greatest resonance stabilization ?



26. Which of the following is most polar.



27.

(I) Br, which is not correct about (I)

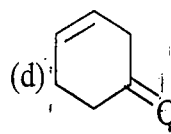
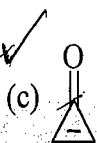
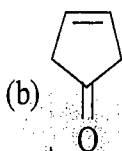
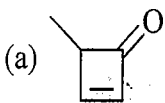
(a) I is more soluble than bromocyclopropane

(b) I gives pale yellow ppt. on addition with AgNO_3

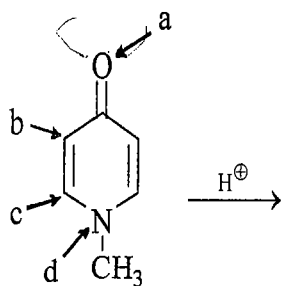
(c) I is having lower dipole moment than bromocyclopropane

(d) I have more ionic character than

28. Dipole moment of which ketone is maximum?



29.



Identify the site, where attack of H^+ is most favourable

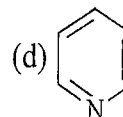
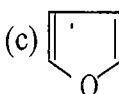
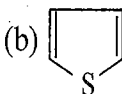
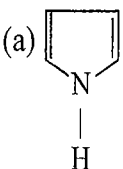
(a) a

(b) b

(c) c

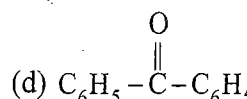
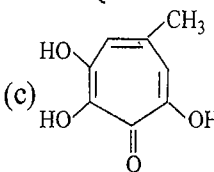
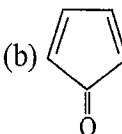
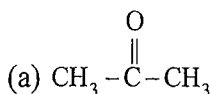
(d) d

30. Which of the following have highest resonance energy.

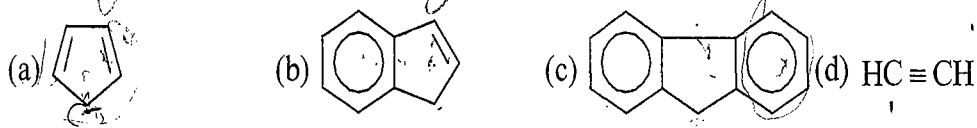


31.

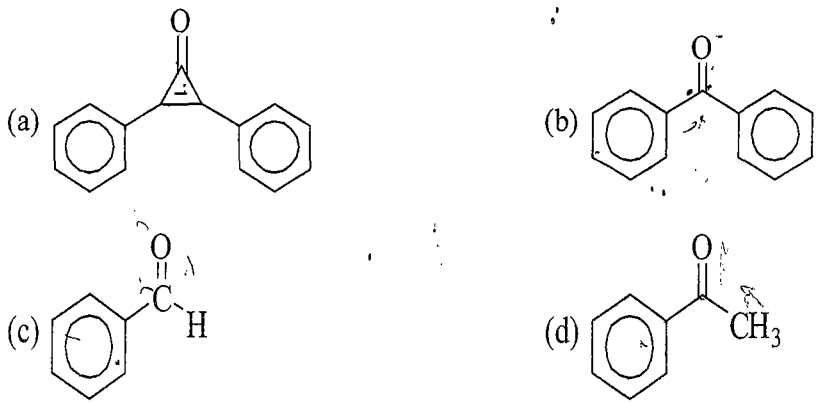
Which one of following carbonyl compound when treated with dilute acid forms the most stable carbocation?



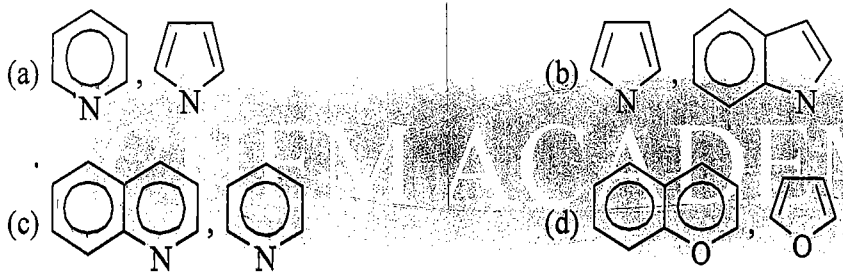
32. Which of the strongest acid in following,



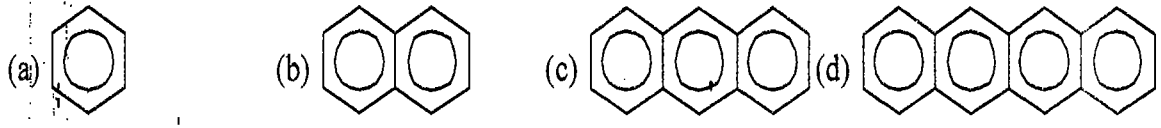
33. Which of the following compounds has the greater dipole moment



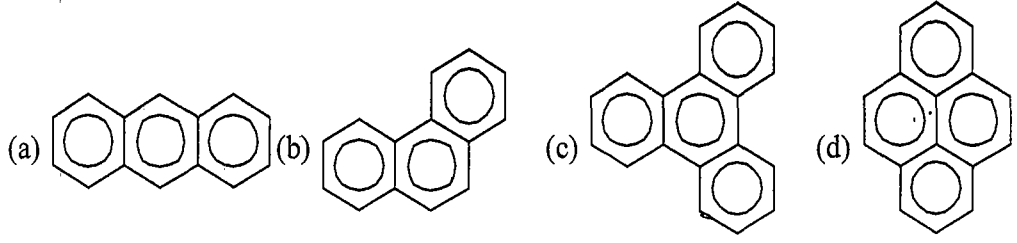
34. Which of the following second one has high Resonance energy



35. Which of the highest resonance energy in following

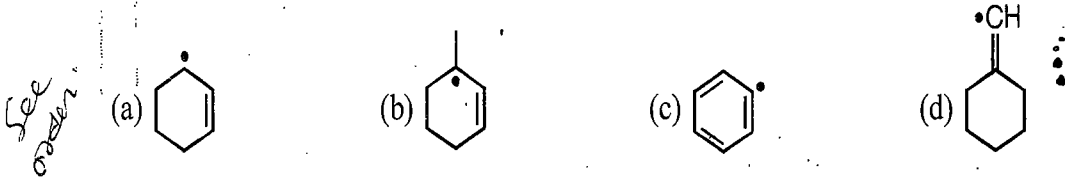


36. Which of the highest resonance energy is following

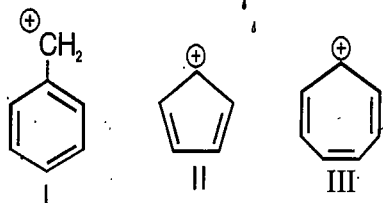


Stability of Intermediates

37. The most stable free radical is

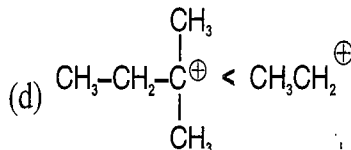
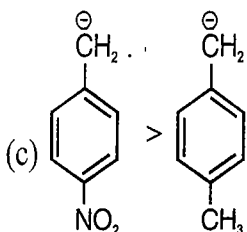
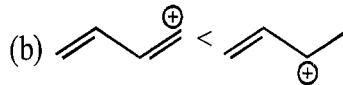
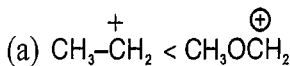


38. Which of the following represents the correct order of stability of the given carbocations?

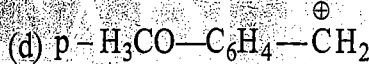
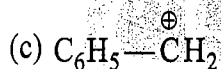
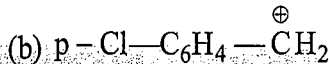


- (a) III > I > II (b) I > III > II (c) III > II > I (d) II > III > I

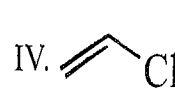
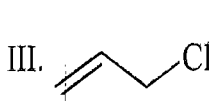
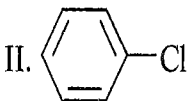
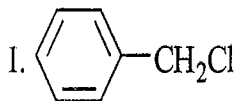
39. Which of the following incorrectly represents the stability of reactivity intermediate?



40. Which of the following species is most stable ?



41. Which pair will not form a stable carbocation ?



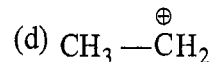
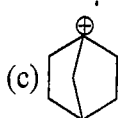
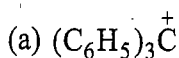
(a) I and II

(b) II and III

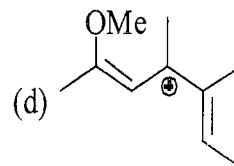
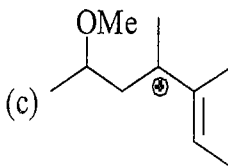
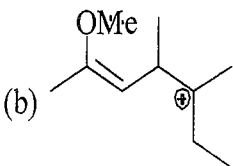
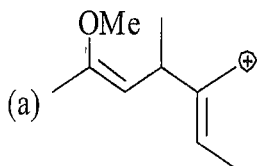
(c) II and IV

(d) III and IV

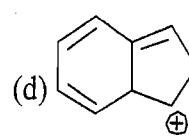
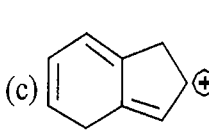
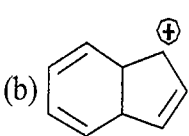
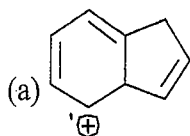
42. Which carbocation is least likely to form as intermediate?



43. Which of the following is the most stabilized carbocation?

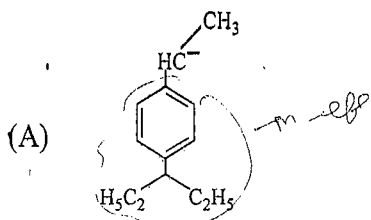


44. Which of the following carbocation is the most stable ?

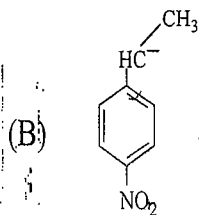


Column-I (Carbanions)

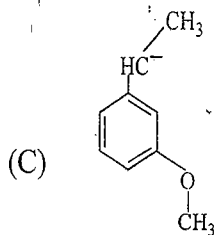
Column-II (Half lives)



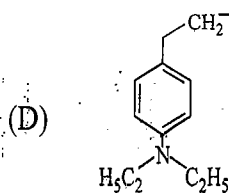
(P) 4.3×10^{-8} s



(Q) 2.5×10^{-5} s



(R) 8.7×10^{-7} s



(S) 1.4×10^{-4} s

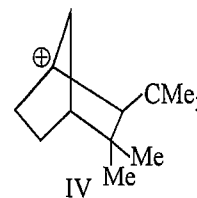
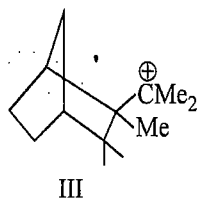
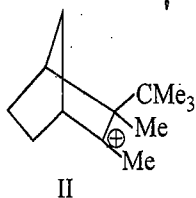
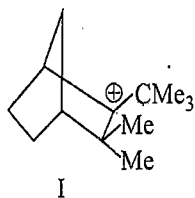
(a) (A-R), (B-S), (C-Q), (D-P)

(b) (A-R), (B-Q), (C-S), (D-P)

(c) (A-S), (B-Q), (C-P), (D-R)

(d) (A-Q), (B-S), (C-P), (D-R)

46. Write correct order of stability



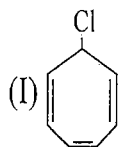
(a) I > II > III > IV

(b) III > II > I > IV

(c) III > I > II > IV

(d) III > II > IV > I

47. Write correct order of reactivity of following halogen derivatives.



(II) $\text{CH}_2=\text{CH}-\text{Cl}$

(III) $\text{Et}_3\text{C}-\text{Cl}$

(IV) PhCH_2Cl

(V) $\text{Ph}_3\text{C}-\text{Cl}$

(a) I > V > IV > III > II

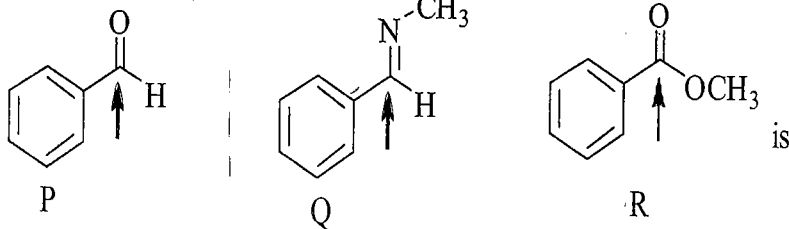
(b) V > IV > I > III > II

(c) V > I > IV > III > II

(d) I > V > III > IV > II

48. The reactivity order of the indicated function groups towards a nucleophile

gmp.



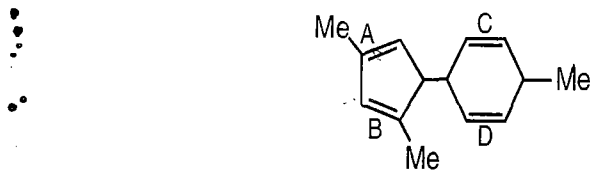
- (a) $P > Q > R$ (b) $Q > P > R$ (c) $Q > R > P$ (d) $R > P > Q$

49. Which of the carbon free radical is most stable

- (a) $\text{CH}_3-\overset{\cdot}{\text{C}}(\text{CH}_3)_2$ (b) $\text{CH}_2-\overset{\cdot}{\text{C}}\text{H}=\text{CH}_2$ (c) $\text{Ph}-\overset{\cdot}{\text{C}}\text{H}-\text{Ph}$ (d) $\text{CH}_3-\overset{\cdot}{\text{C}}\text{H}-\text{Ph}$

gmp.

50. Which of the following double bond in the given molecule is most reactive towards a strong protic acid?

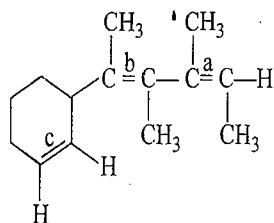


- (a) A (b) B (c) C (d) D

51. Which of the following compounds yield most stable carbanion after rupture of (C_1-C_2) bond:

- (a) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CCl}_3$ (b) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{CBr}_3$ (c) $\text{CH}_3-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{Cl}_3$ (d) none of these

52. Following compound contains three $\text{C}=\text{C}$, arrange these in stability order:



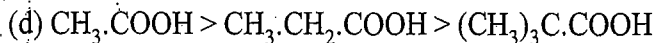
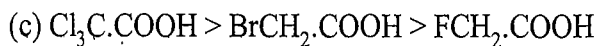
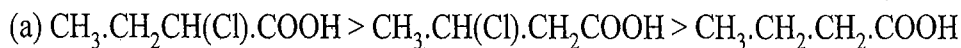
- (a) $b > c > a$ (b) $a > b > c$ (c) $b > a > c$ (d) $c > b > a$

53. The homolytic breaking of the $\text{C}_a - \text{C}_b$ bond is easiest in:

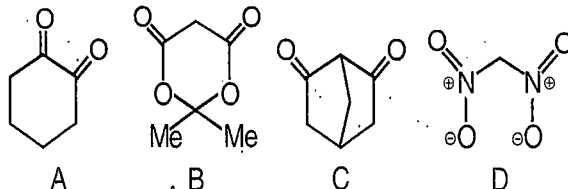
- (a) $\text{H}-\text{C}_a-\text{C}_b-\text{H}$ (b) $\text{H}_3\text{C}-\text{C}_a-\text{C}_b-\text{H}$ (c) $\text{H}_3\text{C}-\text{C}_a-\text{C}_b-\text{H}$ (d) $\text{H}_3\text{C}-\text{C}_a-\text{C}_b-\text{CH}_3$

Acidity & Basicity

54. The acid strength of substituted carboxylic acids is known to be dependent on the nature and position of the substituent. In the following examples, an attempt has been made to arrange the acids in order of acid strength, the strongest first. One of the series is incorrect—which one?

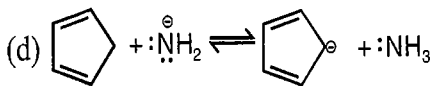
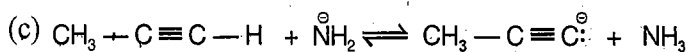
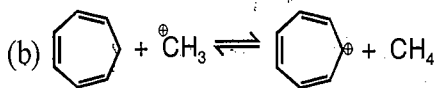


55. Arrange the given carbon acids in the increasing order of acidic strength

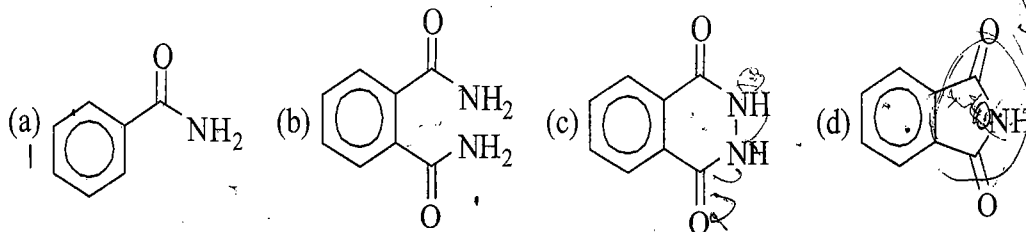


- (a) $A < B < D < C$ (b) $D < C < B < A$ (c) $C < B < D < A$ (d) $C < A < B < D$

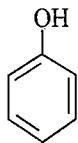
56. For which of the following reactions equilibrium constant (k) is less than unity?



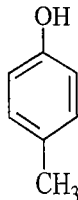
57. Which of the nitrogen compounds shown below is the strongest acid?



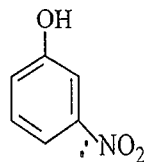
58. In the following compounds:



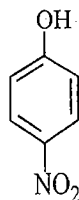
(I)



(II)



(III)



(IV)

The order of acidity is:

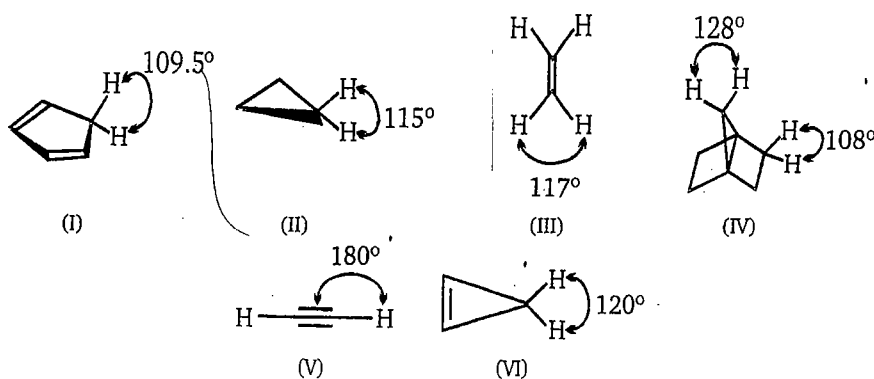
- (a) $\text{III} > \text{IV} > \text{I} > \text{II}$ (b) $\text{I} > \text{IV} > \text{III} > \text{II}$ (c) $\text{II} > \text{I} > \text{III} > \text{IV}$ (d) $\text{IV} > \text{III} > \text{I} > \text{II}$

59. Amongst the following, the most basic compound is:

- (a) $C_6H_5NH_2$ (b) $p\text{-NO}_2\text{-C}_6\text{H}_4\text{NH}_2$ (c) $m\text{-NO}_2\text{-C}_6\text{H}_4\text{NH}_2$ (d) $C_6H_5CH_2NH_2$

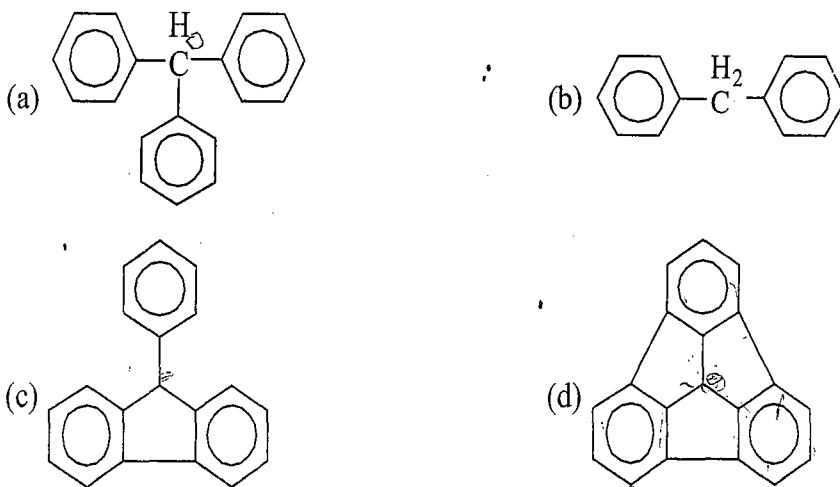
60.

Selected bond angles for six hydrocarbons are shown below. Arrange these hydrocarbons according to their pK_a values, from the lowest to the highest.

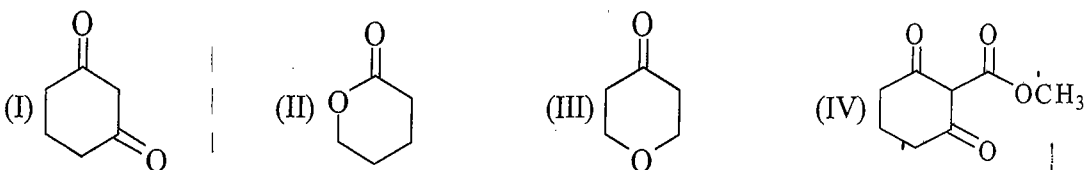


- (a) $V < I < VI < II < III < IV$ (b) $IV < I < II < III < V < VI$
 (c) $II < IV < I < VI < V < III$ (d) $I < V < IV < III < II < VI$

61. Which of the following has lowest pK_a value?



62. Arrange the following in increasing order of their acidic strength.

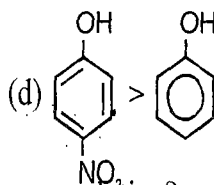
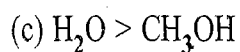
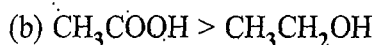
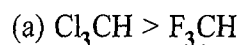


- (a) $III < I < IV < II$ (b) $II < I < IV < III$ (c) $I < III < IV < II$ (d) $II < III < I < IV$

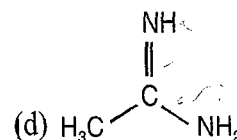
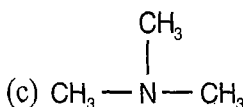
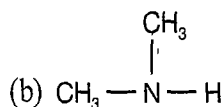
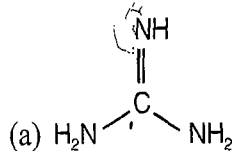
63. Which of the following is the strongest base in water?



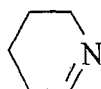
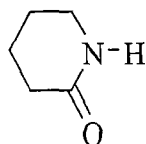
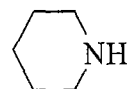
64. Which of the following incorrectly represent the acidic strength of given acids?



65. Which of the following is most basic in aqueous solution?



66.

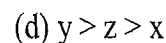
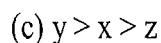
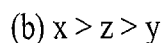
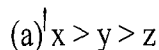


(x)

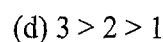
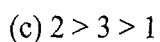
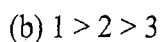
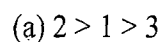
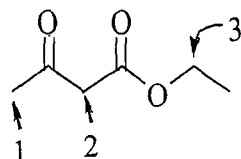
(y)

(z)

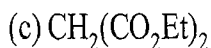
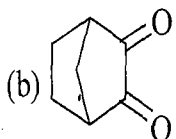
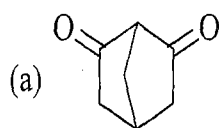
The correct order of decreasing basic strengths of x, y and z is



67. Consider the hydrogen atoms attached to three different carbon atoms (labeled 1, 2 & 3). Rank the attached hydrogen atoms in order from most acidic to least acidic.



68. Which of the following compounds would you expect to be strong carbon acid?



69. Arrange the following compounds in the increasing order of acidic strength.

(i) benzoic acid

(ii) p-methoxybenzoic acid

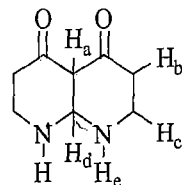
(iii) o-methoxybenzoic acid

(a) $i < ii < iii$

(b) $iii < i < ii$

(c) $ii < i < iii$

(d) $iii < ii < i$



Identify the most acidic hydrogen present in the above compound:

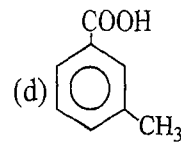
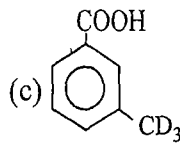
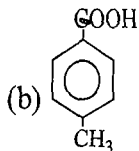
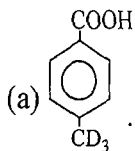
(a) a

(b) b

(c) c

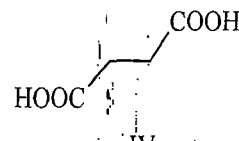
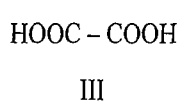
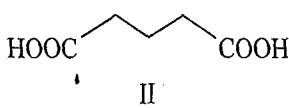
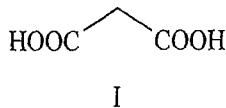
(d) d

71. Which of the following is least acidic:



amp
72

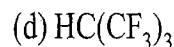
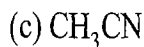
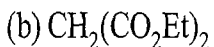
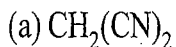
Indicate the correct order of acidity (first ionization) in the following dicarboxylic acids:



(a) I > II > III > IV (b) II > IV > I > III (c) III > I > IV > II (d) IV > II > I > III

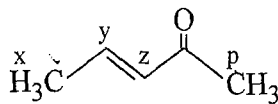
73

Which is the strongest acid among following



74

The abstraction of proton will be fastest, in which carbon in the following compound,



(a) x

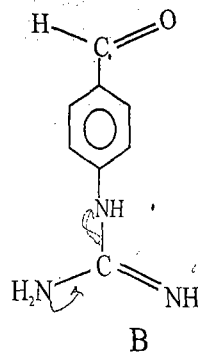
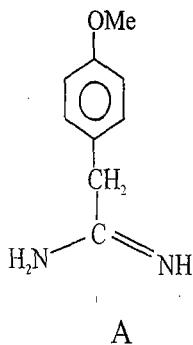
(b) y

(c) z

(d) p

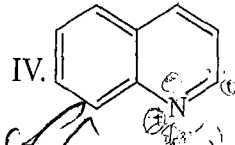
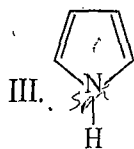
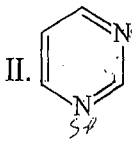
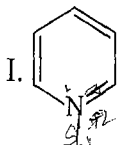
75

Which is more basic



76

Arrange the following in the increasing order of their basic strength:



(a) I < II < III < IV

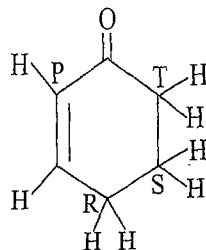
(b) IV < III < II < I

(c) IV < I < II < III

(d) III < II < IV < I

77

Write the correct order of K_a of marked position C-H bond in following compound.



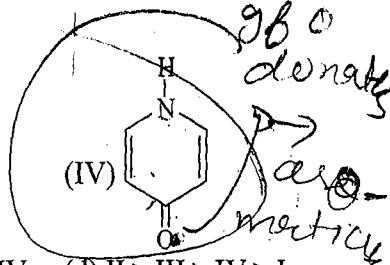
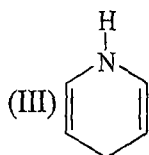
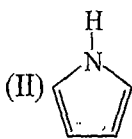
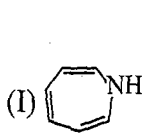
(a) R > P > T > S

(b) T > P > R > S

(c) R > T > P > S

(d) P > R > S > T

78. Write the correct basicity order of the following compounds.

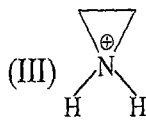
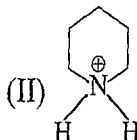
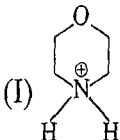


- (a) I > III > IV > II (b) I > III > II > IV (c) I > IV > III > II (d) II > III > IV > I

79. Which of the following, has the most acidic hydrogen?

- (a) 3-hexanone (b) 2, 4-hexanedione (c) 2, 5-hexanedione (d) 2, 3-hexanedione

80. Which of the following is the correct order of acidic nature.



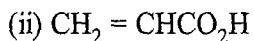
- (a) III > I > II

- (b) I > II > III

- (c) II > I > III

- (d) III > II > I

81. The correct increasing order of K_a of following acid.



- (a) (i) < (ii) < (iii)

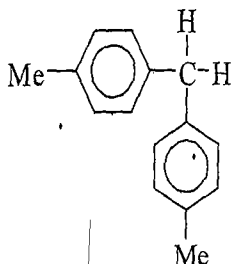
- (b) (ii) < (iii) < (i)

- (c) (ii) < (i) < (iii)

- (d) (iii) < (i) < (ii)

82.

Which of increasing acidic order is correct for below organic compounds



- (I) $\text{PhCH}_2 - \text{H}$

- (II)

- (III) $(\text{Ph}_2)_2\text{CH}-\text{H}$

- (IV) $(\text{Ph}_3)_3\text{C}-\text{H}$

- (a) I < II < III < IV

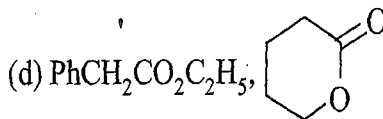
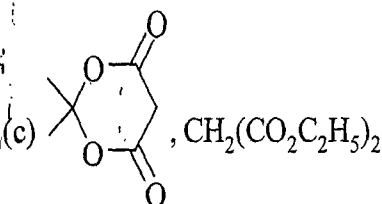
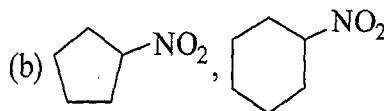
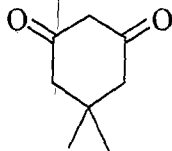
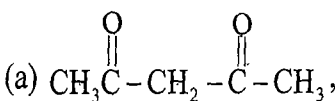
- (b) II < I < III < IV

- (c) III < I < II < IV

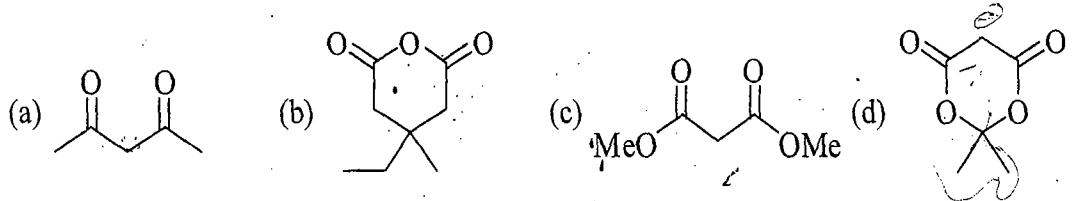
- (d) IV < III < I < II

83.

Among the following pairs in which case the second compound has more acidic hydrogen



84. Select the strongest acid in the following *check order*



85. Select the strongest acid in the following
 (a) C_6H_5OH (b) $o\text{-MeC}_6H_4OH$ (c) $m\text{-MeC}_6H_4OH$ (d) $p\text{-MeC}_6H_4OH$

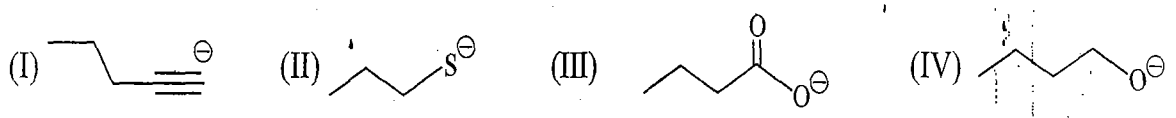
86. Select the weakest acid in the following
 (a) $PhOH$ (b) $o\text{-O}_2NC_6H_5OH$ (c) Picric acid (d) $p\text{-O}_2NC_6H_5OH$

87. Select the highest pK_a value of the following
 (a) $PhCOOH$ (b) $o\text{-O}_2NC_6H_5COOH$
 (c) $m\text{-O}_2NC_6H_5COOH$ (d) $p\text{-O}_2NC_6H_5COOH$

88. Weakest base among the following is :

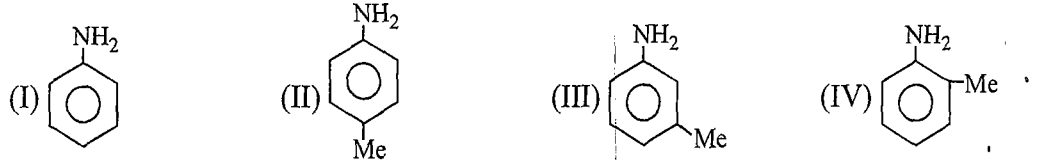


89. Rank the following in order of decreasing basicity.



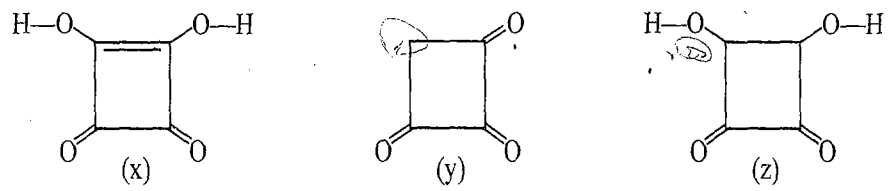
(a) $IV > I > III > II$ (b) $I > IV > II > III$ (c) $II > I > III > II$ (d) $IV > III > I > II$

90. Correct order of basicity is: $4 > 1 > 3 > 2 \Rightarrow$ correct order



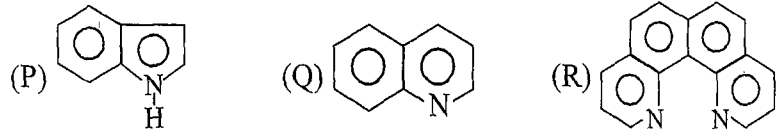
(a) $I > II > III > IV$ (b) $II > I > III > IV$ (c) $II > III > I > IV$ (d) $II > III > IV > I$

91. Write the pK_a order of the following acids.



(a) $x > y > z$ (b) $x > z > y$ (c) $z > y > x$ (d) $y > x > z$

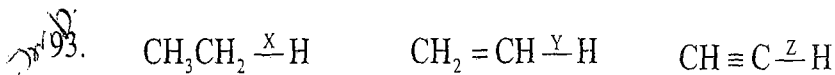
92. Which of the following is the correct order of basic nature.



(a) $Q > R > P$ (b) $R > Q > P$ (c) $R > P > Q$ (d) $Q > P > R$

check it, abnormality

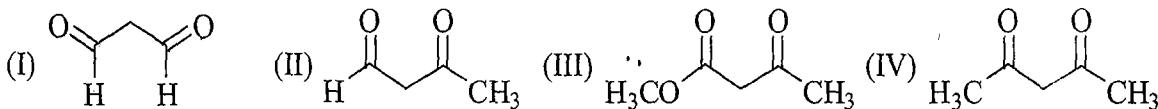
gmb



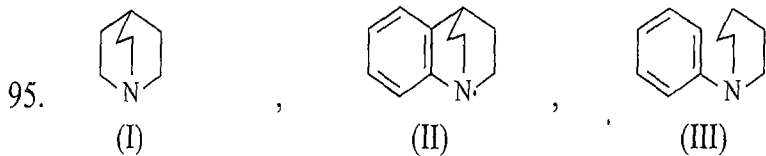
The correct order of bond strength in above compounds

- (a) $Z < Y < X$ (b) $Y < X < Z$ (c) $Z < X < Y$ (d) $Z > Y > X$

94. Correct order of acidic strength of the following compound is

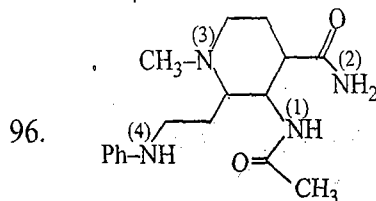


- (a) $I > IV > II > III$ (b) $IV > II > I > III$ (c) $I > II > IV > III$ (d) $IV > III > II > I$



Arrange these compounds in basic strength order:

- (a) $I > II > III$ (b) $II > I > III$ (c) $III > I > II$ (d) $II > III > I$



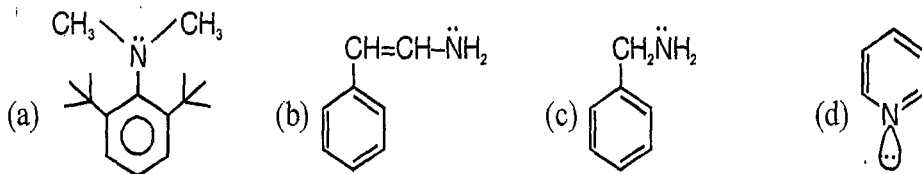
Correct order of basicity is

- (a) $3 > 1 > 2 > 4$ (b) $3 < 1 < 2 < 4$ (c) $3 < 4 < 1 < 2$ (d) $3 > 4 > 1 > 2$

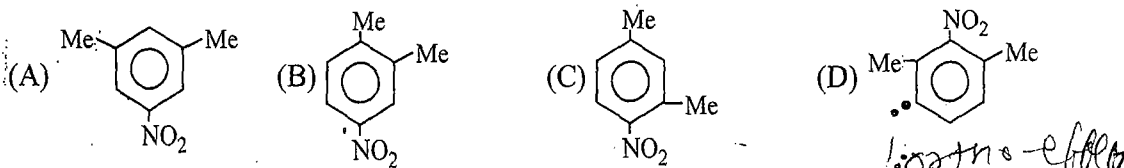
1 is most basic than 2

SIR/SIP

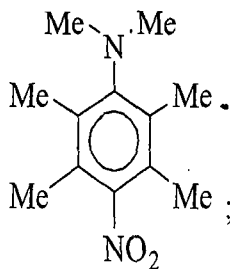
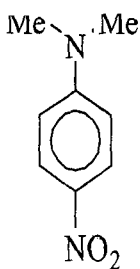
97. In which of the following molecules the lone pair of nitrogen atom is participating in resonance?



98. Arrange the following compound, in order of C-N bond length.



- (a) $D > C > B > A$ (b) $D > C > A > B$ (c) $A > B > C > D$ (d) $D > A > C > B$



; Dipole moments of given compound will be:

(a) (A) = 6.87D, (B) = 4.11D

(b) (A) = 4.11 D, (B) = 6.87 D

(c) (A) = 4.11 D, (B) = 4.11 D

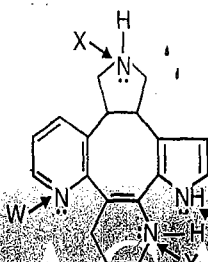
(d) (A) = 6.87 D, (B) = 6.87 D'

EXERCISE - II

Multiple Answer Type

Resonance

1. Which lone pairs of nitrogens in the following molecule participate in delocalization?



g m/p.

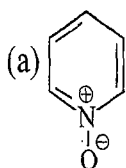
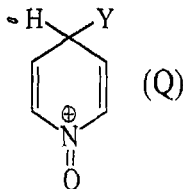
(a) W

(b) X

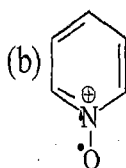
(c) Y

(d) Z

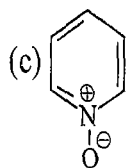
2. A pyridine derivative (P) reacts with (Y). (Y) can be free radical, cation or anion. The structure of intermediate (Q) formed in reaction is given below (P) and (Y) respectively can be



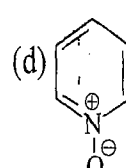
+ Y[•]



+ Y[•]



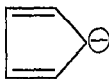
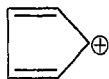
+ Y[⊖]



+ Y[⊕]

Aromaticity

3. Identify the correct statement(s).



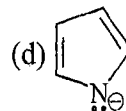
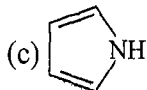
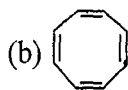
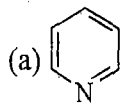
(a) I & III are antiaromatic

(b) III & IV are non-aromatic

(c) II alone is aromatic

(d) II & IV are non-aromatic

4. Which species is/are aromatic?



Aromatic character is possible only when

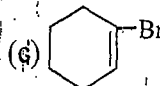
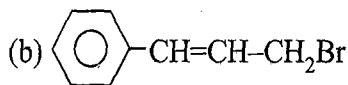
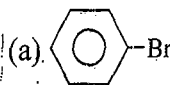
(a) four electrons are delocalized

(b) the molecule is cyclic and planar having delocalized $(4n + 2)\pi$ electrons where $n = 0, 1, 2, 3, \dots$

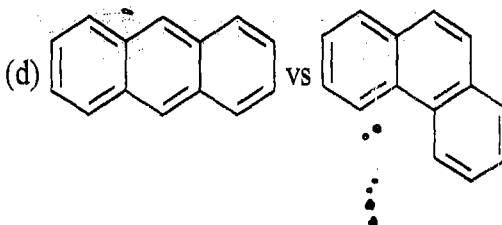
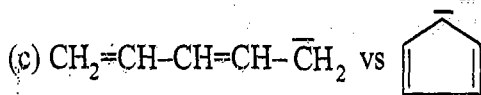
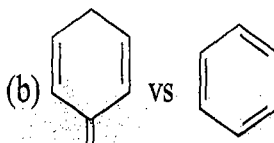
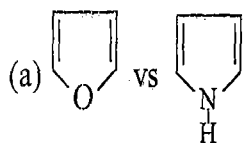
(c) alternate sigma (σ) & pi (π) bond are present.

(d) None is true

6. Which does not react with AgNO_3 to give ppt.?



7. In which of the following the 2nd structure having more resonance energy.



Stability of Intermediate

8. Which is/are true statement(s)?

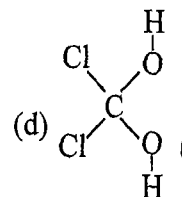
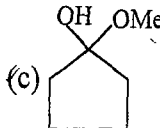
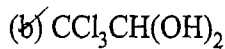
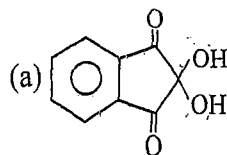
(a) Protonation increases electrophilic nature of carbonyl group

(b) CF_3SO_3^- is better leaving group than CH_3SO_3^-

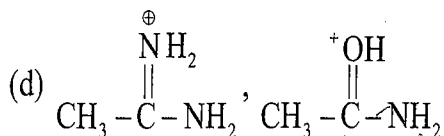
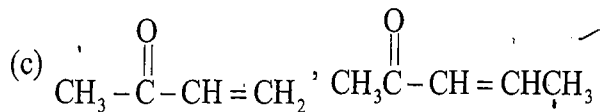
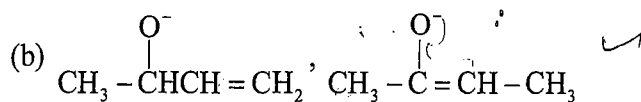
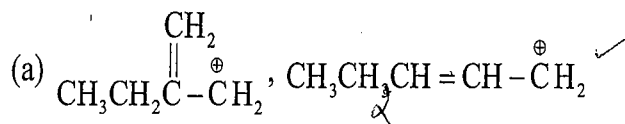
(c) Benzyl carbonium ion is stabilised by resonance

(d) $\text{CCl}_3\text{CH}(\text{OH})_2$ is stable hydrate

9. Select the stable molecule (s):

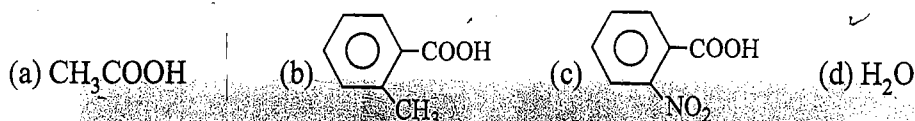


10. Which of the following second one is/are stable

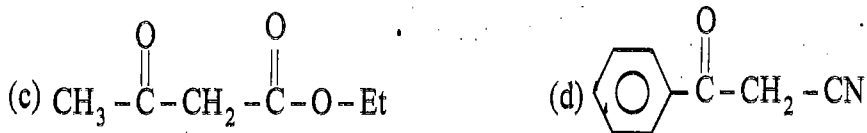
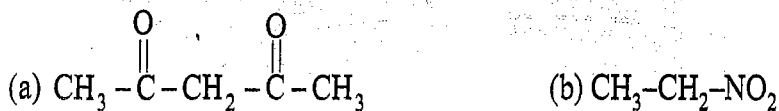


Acidity & Basicity

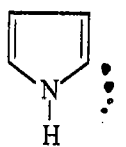
11. Which is/are less acidic than Benzoic acid?



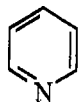
12. Which have active methylene group?



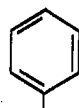
13.



pyrrole (I)



pyridine (II)

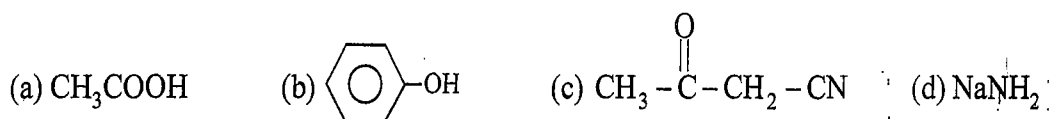


aniline (III)

which is/are correct statements?

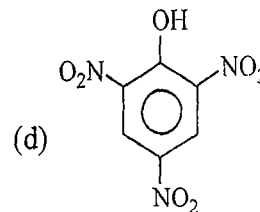
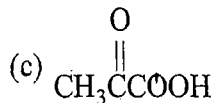
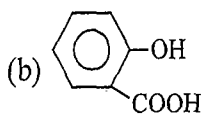
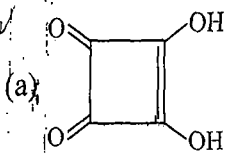
- (a) I is more basic than II (b) II is more basic than I and III
 (c) III is more basic than II (d) all are aromatic bases

14. Which of the following have acidic hydrogen?



15. Amongst the following compounds, the compound(s) which can give NaHCO_3 test ?

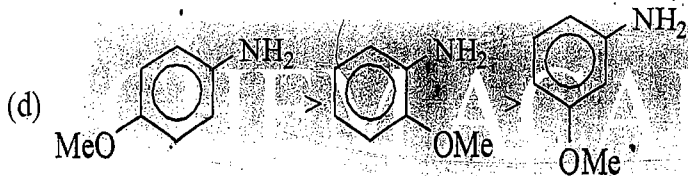
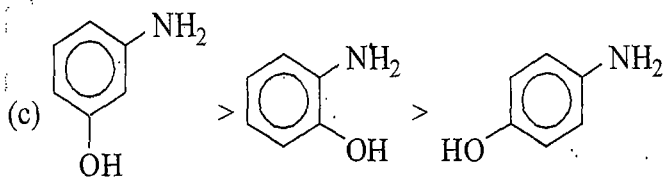
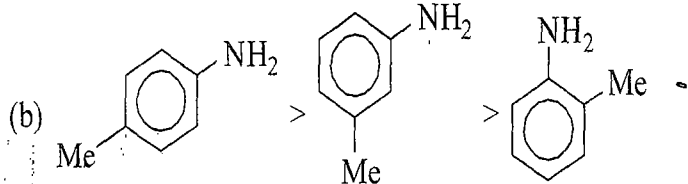
aromatic
acetic



SIR/SIP

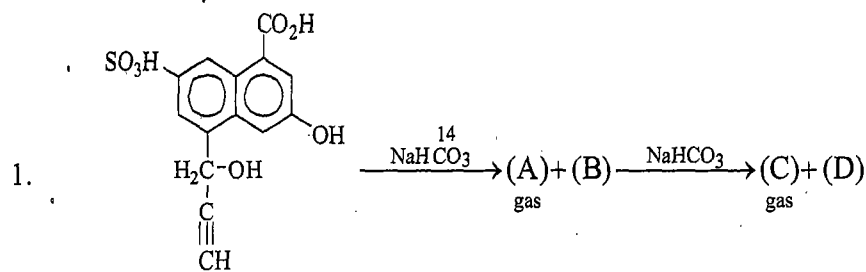
16. Which of the following basicity order is/are correct

(a) $\text{PhNMe}_2 > \text{PhNHMe} > \text{PhNH}_2$

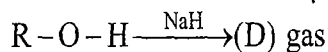
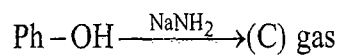
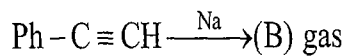
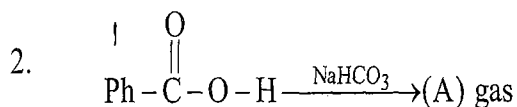


EXERCISE - III

Numerical and Subjective Answer Type

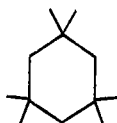


Sum of molecular mass of gas (A + C) is



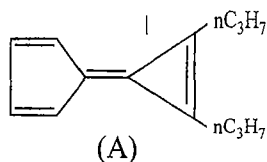
Sum of molecular mass of gas A + B + C + D is:

3.



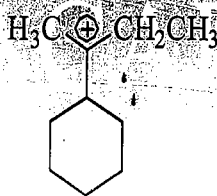
In above compound total number of 2° hydrogen atoms are :

4. Number of π -electrons in Cyclobutadienyl anion $(C_4H_4)^{2-}$ is
5. P, Q, R, S and T are the number of π electron in a, b, c, d and e respectively. What is the value of $P + Q + R + S + T$.
- (a) cyclopropenylium ion (b) cyclopentadienide anion
 (c) cycloheptatrienylium ion (d) cyclooctatetraene dianion
 (e) [12] Annulene dianion
6. Ordinarily the barrier to rotation about a carbon-carbon double bond is quite high but compound A have a rotational barrier of only about 20 K cal / mole

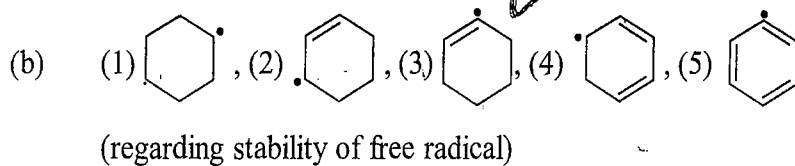
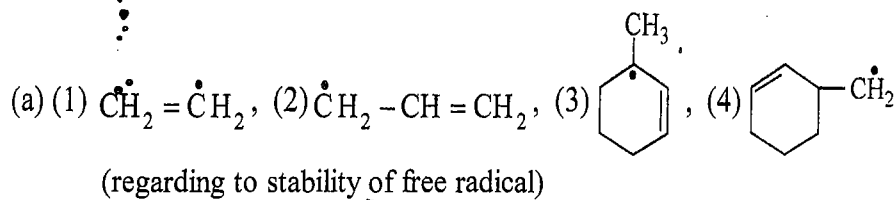


What is the reason for this ?

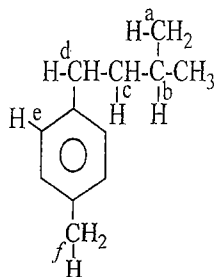
7. The total number of contributing structures showing hyperconjugation (involving C — H bonds) for the following carbocation is



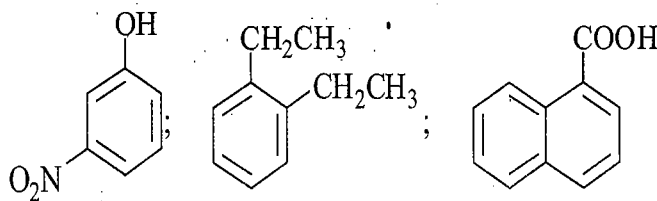
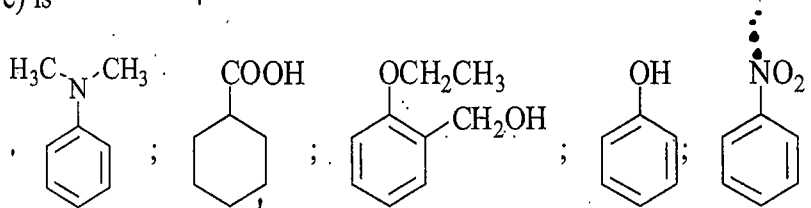
8. Arrange the following in increasing order of stability.



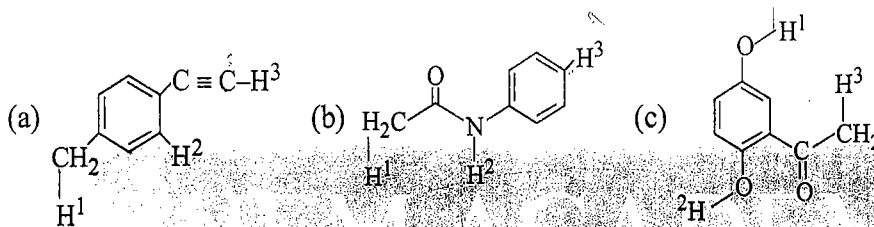
9. Arrange in order of C—H bond energy



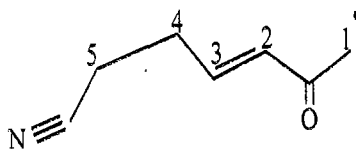
10. Amongst the following, the total number of compounds soluble in aqueous NaOH (at room temperature) is



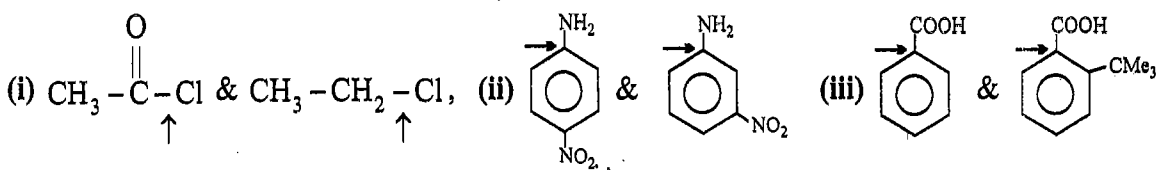
11. For the following compounds, arrange the labelled proton in increasing order of their ease of deprotonation:



12. Which of the following carbon will be deprotonated first on treatment with base.



13. In which of the following pairs, indicated bond is of greater strength.



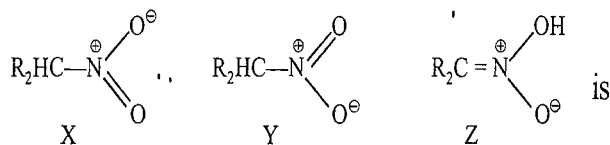
14. Among Oc1c(I)c(C)c([N+](=O)[O-])cc1 & Oc1c(I)c(C)c([N+](=O)[O-])cc1 which is more acidic.

EXERCISE - IV

Previous Year Questions

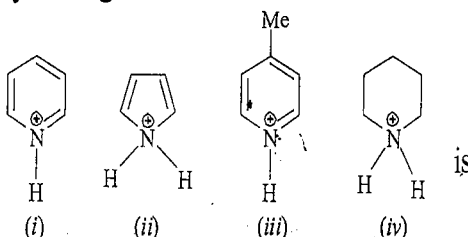
IIT-JAM Previous Year Questions

1. The correct statement describing the relationship between



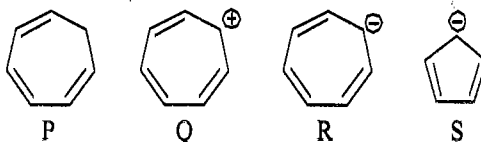
- (a) X and Y are resonance structures and Z is a tautomer
(b) X and Y are tautomer and Z is a resonance structures
(c) X, Y and Z are all resonance structures
(d) X, Y and Z are all tautomers

2. The correct order of acidity among



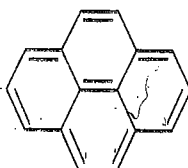
- (a) (i) < (ii) < (iii) < (iv) (b) (iv) < (iii) < (i) < (ii)
(c) (ii) < (i) < (iii) < (iv) (d) (ii) < (iv) < (i) < (iii)

3. Which of the following are aromatic ?



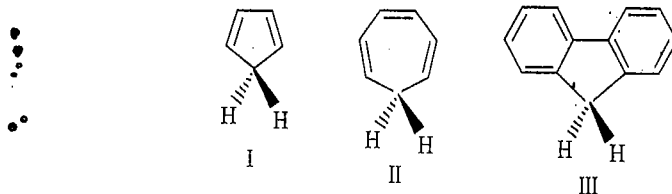
- (a) P and Q (b) Q and R (c) R and S (d) Q and S

4. The value of 'n' for the following molecule according to Huckel's rule is :



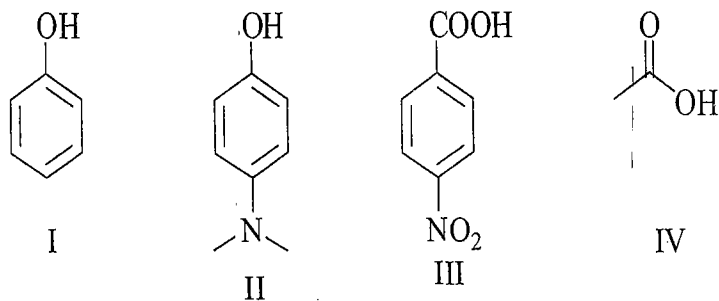
- (a) 16 (b) 4 (c) 3 (d) 14

5. The increasing order of the acidity of the hydrogen marked in **bold italics** among the following is :



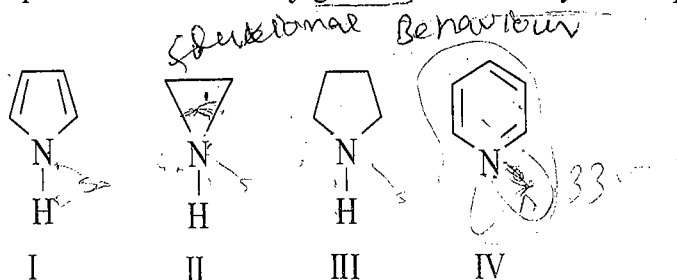
- (a) III < II < I (b) II < I < III (c) I < II < III (d) II < III < I

6. The correct order of pKa value for the following compounds is



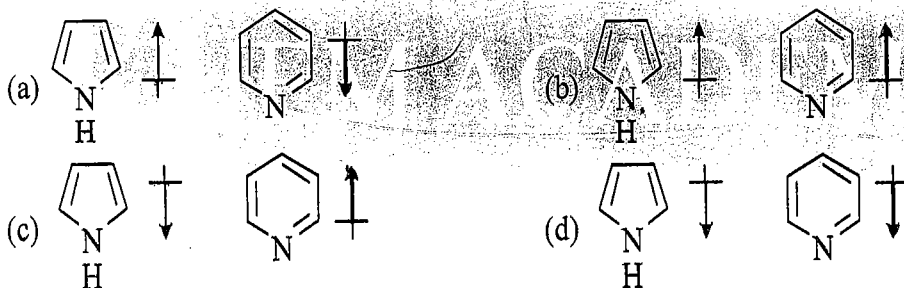
- (a) II > I > III > IV (b) II > I > IV > III (c) III > IV > I > II (d) IV > II > I > III

7. The correct order of the pKa values for the conjugate acids of heterocyclic compounds give below is

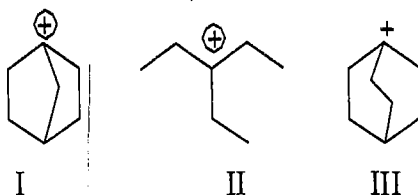


- (a) II > III > I > IV (b) IV > II > III > I (c) III > II > IV > I (d) III > IV > II > I

8. The correct orientations of dipoles in pyrrole and pyridine is :

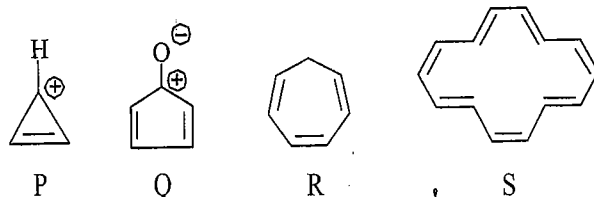


9. The correct order of stability of the following carbocation is



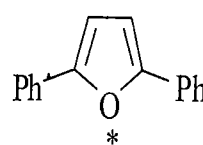
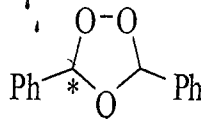
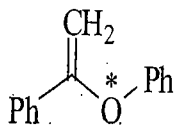
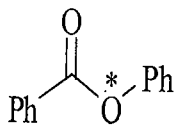
- (a) II > I > III (b) III > II > I (c) I > III > II (d) II > III > I

10. The species/compounds that are aromatic among the following are



- (a) R and S (b) P and Q (c) Q and S (d) P and S

11. Hybridizations of the atoms indicated with the asterisk (*) in the following compounds sequentially are :



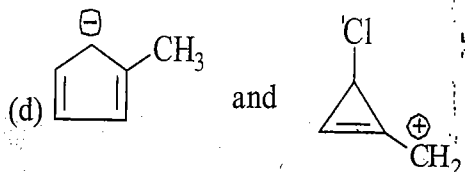
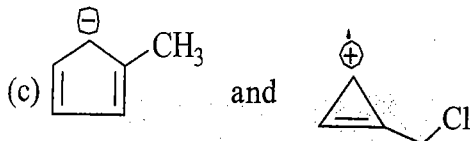
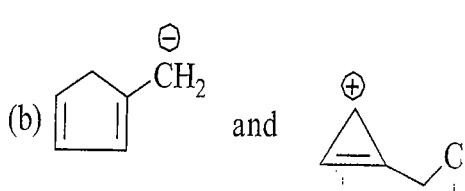
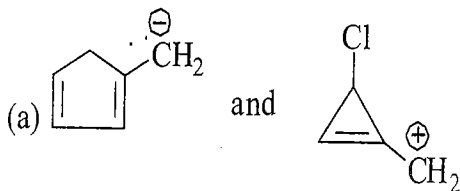
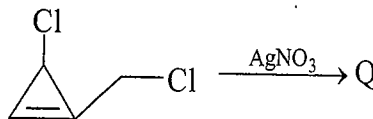
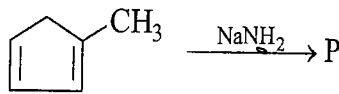
(a) sp^2, sp^2, sp^3, sp^2

(b) sp^2, sp^3, sp^3, sp^2

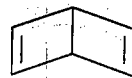
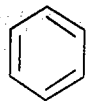
(c) sp^3, sp^3, sp^3, sp^2

(d) sp^2, sp^2, sp^3, sp^3

12. The product P and Q in the following reactions, respectively are



13. Benzene and dewar benzene are :



Benzene

Dewar Benzene

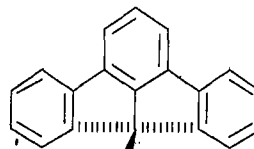
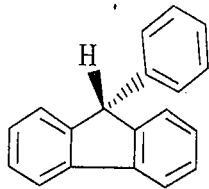
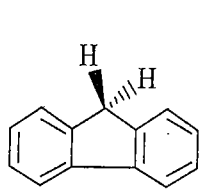
(a) Canonical forms

(b) Structural isomers

(c) Tautomers

(d) Conformational isomers

14. Arrange the following in the correct order of acidity of the hydrogen indicated in bold.



(a) $P > Q > R$

(b) $R > Q > P$

(c) $Q > R > P$

(d) $P > R > Q$

15. Arrange the following in the decreasing order of acidity of the hydrogen indicated in italics

(i) CH_3COCH_3

(ii) $CH_3COCH_2COCH_3$

(iii) $CH_3OOCCH_2COOCH_3$

(iv) $CH_3COCH_2NO_2$

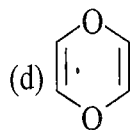
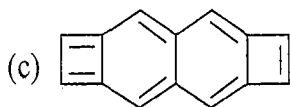
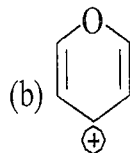
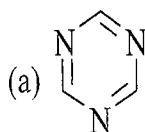
(a) (ii) > (iii) > (i) > (iv)

(b) (iv) > (ii) > (iii) > (i)

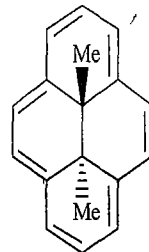
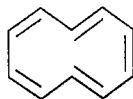
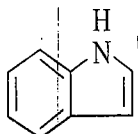
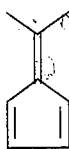
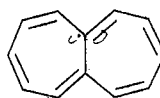
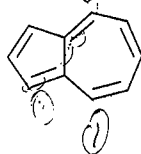
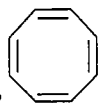
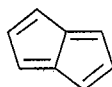
(c) (iv) > (iii) > (ii) > (i)

(d) (ii) > (iv) > (iii) > (i)

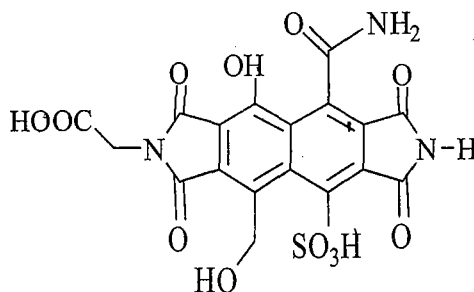
16. Phenol is less acidic than
 (a) acetic acid (b) p-methoxy phenol
 (c) p-nitrophenol (d) ethanol
17. Which of the following species is/are aromatic in nature ?



18. Among the following, the number of molecules that are aromatic is

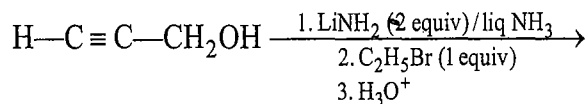


19. The amount (in gram) of NaOH (MW = 40) required for complete neutralization of one mole of the following compound is



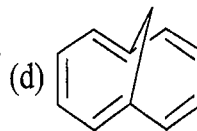
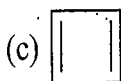
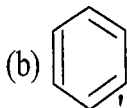
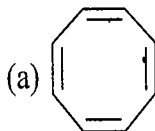
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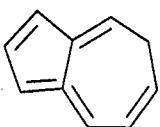
20. The major product obtained in the following reaction is



- (a) $\text{CH}_3\text{CH}_2-\text{C}\equiv\text{C}-\text{CH}_2\text{OH}$ (b) $\text{H}-\text{C}\equiv\text{C}-\text{CH}_2\text{OCH}_2\text{CH}_3$
 (c) $\text{CH}_3\text{CH}_2-\text{C}\equiv\text{C}-\text{CH}_2\text{NH}_2$ (d) $\text{H}-\text{C}\equiv\text{C}-\text{CH}_2\text{NH}-\text{CH}_2\text{CH}_3$

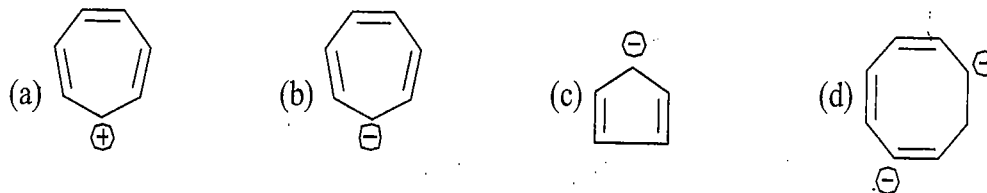
21. Among the following compounds, the one that is non-aromatic is



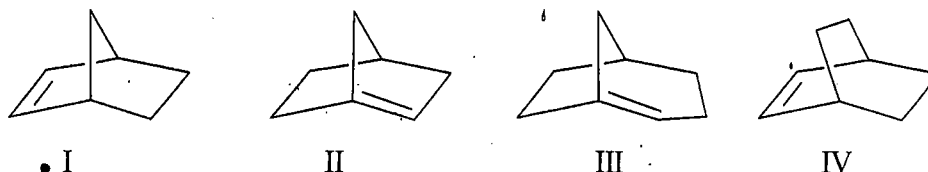
22. The compound  is

- (a) Aromatic and has high dipole moment (b) Aromatic and has no dipole moment
(c) non-aromatic and has high dipole moment (d) anti-aromatic and has no dipole moment

23. The compound that is **NOT** aromatic is

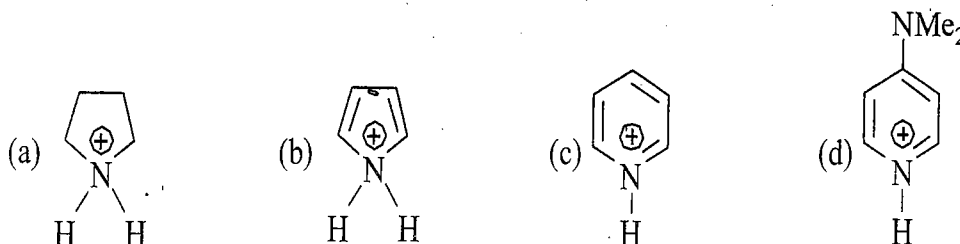


24. The order of stability for the following cyclic olefins is

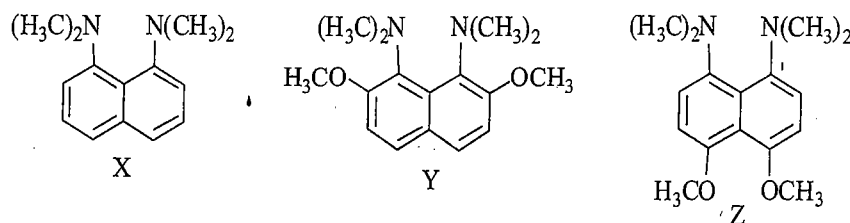


- (a) I < II < III < IV (b) II < III < IV < I (c) II < III < I < IV (d) IV < II < I < III

25. The most acidic species is

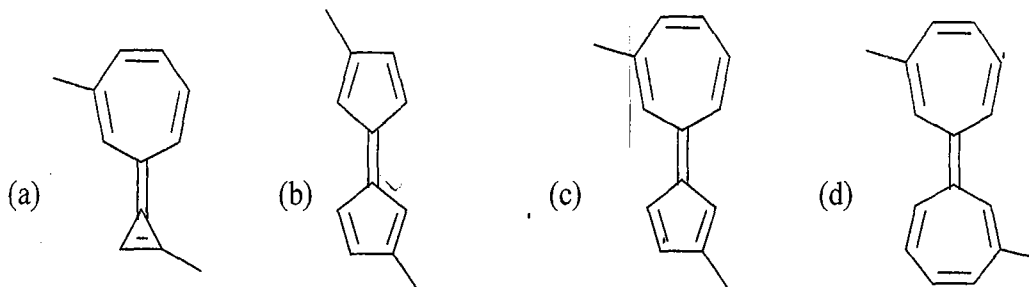


26. The increasing order of basicity among the following compounds is

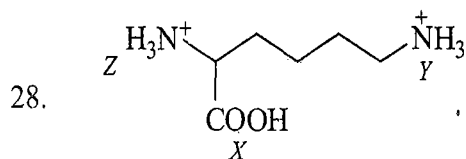


- (a) Y < X < Z (b) Y < Z < X (c) X < Z < Y (d) X < Y < Z

27. Amongst, the following, the compound which has the lowest energy barrier for the cis-trans isomerisation is

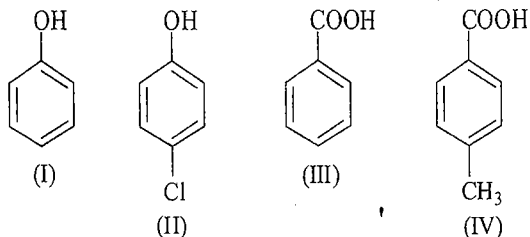


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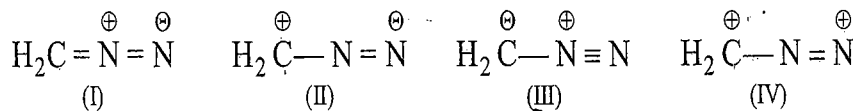


Arrange in order of increasing acidic strength

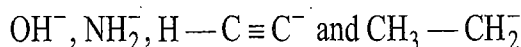
- (a) $X > Z > Y$ (b) $Z < X > Y$ (c) $X > Y > Z$ (d) $Z > X > Y$
29. Hyperconjugation involves overlap of the following orbitals
- (a) $\sigma-\sigma$ (b) $\sigma-p$ (c) $p-p$ (d) $\pi-\pi$
30. The correct acidity order of the following is :



- (a) (III) > (IV) > (II) > (I) (b) (IV) > (III) > (I) > (II)
- (c) (III) > (II) > (I) > (IV) (d) (II) > (III) > (IV) > (I)
31. The correct stability order of the following resonance structure is

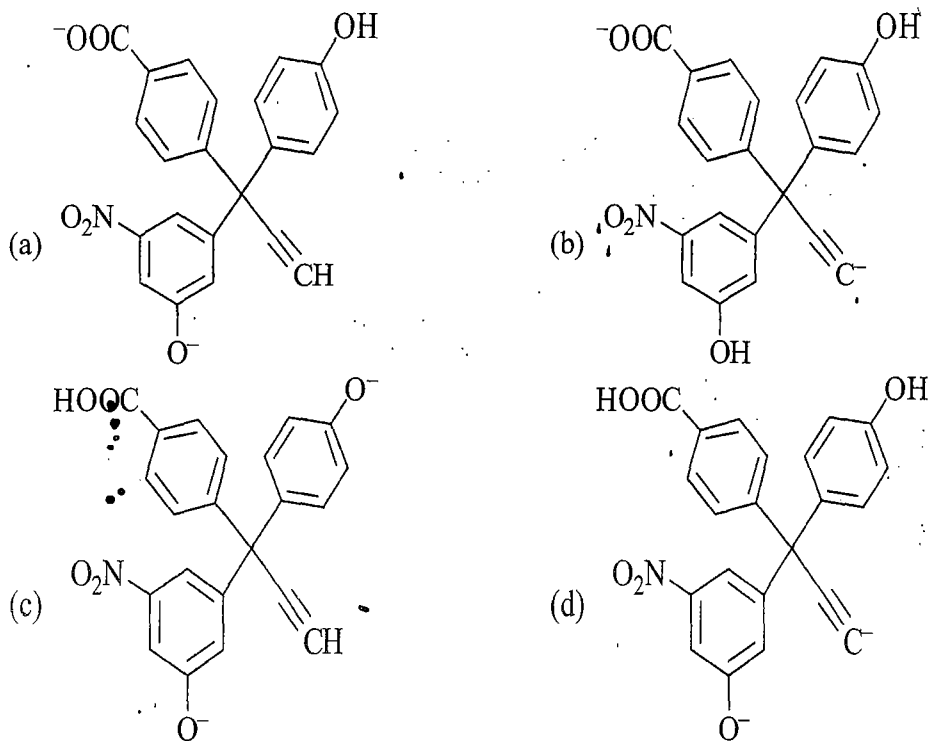
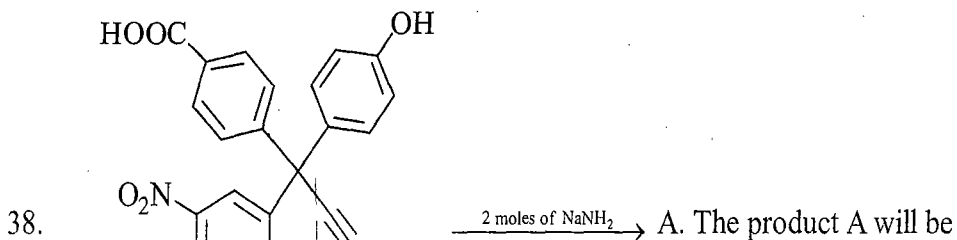
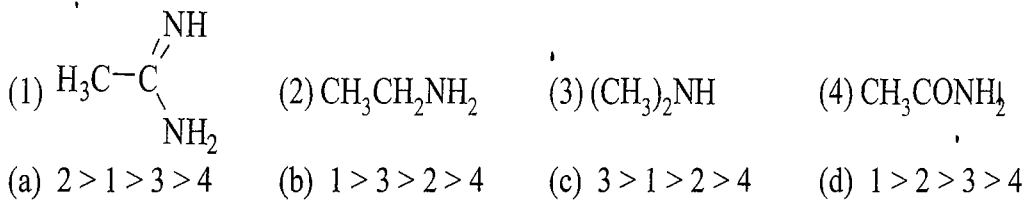


- (a) (I) > (II) > (IV) > (III) (b) (I) > (III) > (II) > (IV)
- (c) (II) > (I) > (III) > (IV) (d) (III) > (I) > (IV) > (II)
32. Among the following compounds, the most acidic is :
- (a) *p*-nitrophenol (b) *p*-hydroxybenzoic acid
- (c) *o*-hydroxybenzoic acid (d) *p*-toluic acid
33. Amongst the following, the most basic compound is
- (a) benzylamine (b) aniline (c) acetanilide (d) *p*-nitroaniline
34. What is the decreasing order of strength of the bases ?



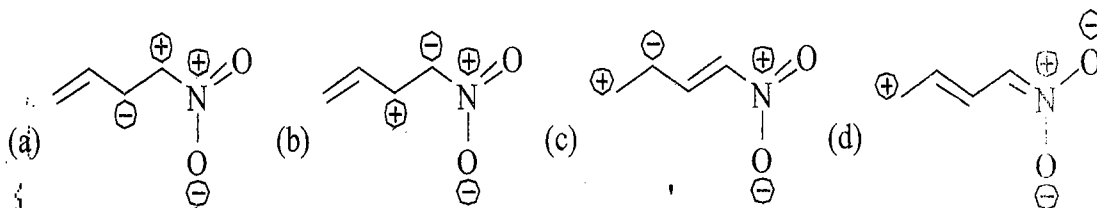
- (a) $\text{CH}_3-\text{CH}_2^- > \text{NH}_2^- > \text{H}-\text{C}\equiv\text{C}^- > \text{OH}^-$
- (b) $\text{H}-\text{C}\equiv\text{C}^- > \text{CH}_3-\text{CH}_2^- > \text{NH}_2^- > \text{OH}^-$
- (c) $\text{OH}^- > \text{NH}_2^- > \text{H}-\text{C}\equiv\text{C}^- > \text{CH}_3-\text{CH}_2^-$
- (d) $\text{NH}_2^- > \text{H}-\text{C}\equiv\text{C}^- > \text{OH}^- > \text{CH}_3-\text{CH}_2^-$

35. Among the following compounds, the strongest acid is
 (a) $\text{HC}\equiv\text{CH}$ (b) C_6H_6 (c) C_2H_6 (d) CH_3OH
36. Among the following, the strongest base is
 (a) $\text{C}_6\text{H}_5\text{NH}_2$ (b) $p\text{-NO}_2\text{C}_6\text{H}_4\text{NH}_2$ (c) $m\text{-NO}_2\text{C}_6\text{H}_4\text{NH}_2$ (d) $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$
37. The correct order of basicities of the following compounds is



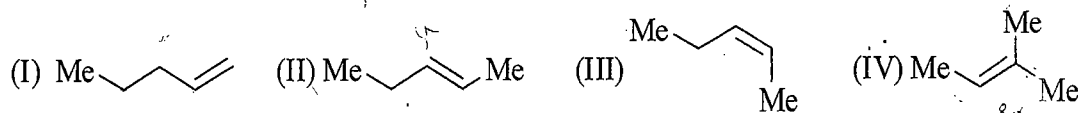
39. For 1-methoxy-1, 3-butadiene, which of the following resonating structure is least stable ?
- (a) $\overset{\oplus}{\text{C}}\text{H}_2-\overset{\oplus}{\text{C}}\text{H}-\text{CH}=\text{CH}-\text{O}-\text{CH}_3$ (b) $\overset{\oplus}{\text{C}}\text{H}_2-\text{CH}=\text{CH}-\text{CH}=\overset{\oplus}{\text{O}}-\text{CH}_3$
- (c) $\text{CH}_2=\text{CH}-\overset{\oplus}{\text{C}}\text{H}-\overset{\ominus}{\text{C}}\text{H}-\text{O}-\text{CH}_3$ (d) $\text{CH}_2=\text{CH}-\overset{\oplus}{\text{C}}\text{H}-\text{CH}=\overset{\oplus}{\text{O}}-\text{CH}_3$

40. Among the following, the least stable resonance structure is:



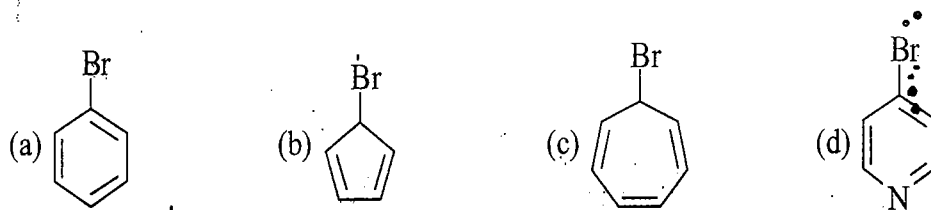
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41. The correct order of heat of hydrogenation for the following compound is

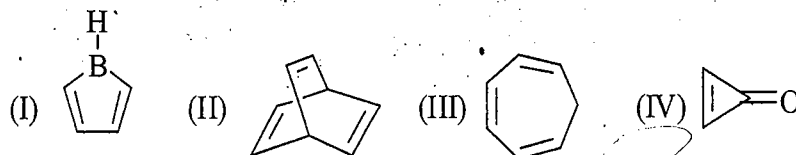


(a) I > II > III > IV (b) I > III > II > IV (c) IV > I > III > II (d) IV > II > I > III

42. The compound that gives precipitate on warming with aqueous AgNO_3 is

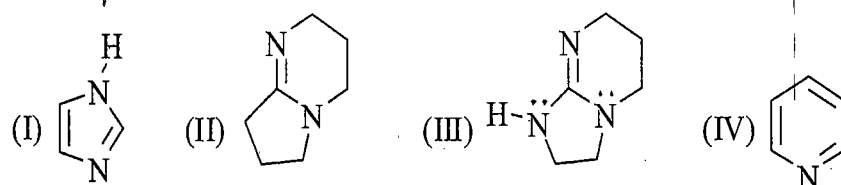


43. The compound that is antiaromatic is



(a) I (b) II (c) III (d) IV

44. The decreasing order of basicity of the following compound is



(a) I > II > III > IV (b) IV > I > II > III (c) III > II > I > IV (d) IV > III > II > I

ANSWER KEY

EXERCISE I

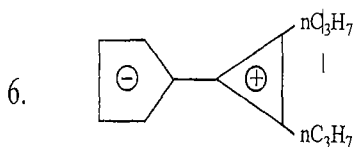
- | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|
| 1. d | 2. b | 3. a | 4. b | 5. c | 6. d | 7. b |
| 8. c | 9. d | 10. b | 11. b | 12. a | 13. c | 14. c |
| 15. d | 16. a | 17. c | 18. c | 19. b | 20. a | 21. b |
| 22. b | 23. b | 24. a | 25. b | 26. b | 27. c | 28. b |
| 29. a | 30. d | 31. c | 32. a | 33. a | 34. b | 35. d |
| 36. c | 37. b | 38. a | 39. d | 40. d | 41. c | 42. c |
| 43. d | 44. c | 45. a | 46. b | 47. a | 48. a | 49. c |
| 50. a | 51. a | 52. c | 53. d | 54. c | 55. d | 56. a |
| 57. d | 58. d | 59. d | 60. d | 61. d | 62. d | 63. b |
| 64. c | 65. a | 66. b | 67. a | 68. d | 69. c | 70. a |
| 71. b | 72. c | 73. d | 74. a | 75. b | 76. c | 77. c |
| 78. a | 79. b | 80. a | 81. a | 82. a | 83. a | 84. a |
| 85. a | 86. a | 87. a | 88. d | 89. b | 90. c | 91. c |
| 92. b | 93. d | 94. c | 95. a | 96. d | 97. b | 98. b |
| 99. a | | | | | | |

EXERCISE-II

- | | | | | | | |
|-------------|-----------|-----------|----------|-----------|---------|------------|
| 1. c,d | 2. b,d | 3. a,c | 4. a,c,d | 5. b,c | 6. a,c | 7. a,b,c,d |
| 8. a,b,c,d | 9. a,b | 10. a,b,c | 11. a,d | 12. a,c,d | 13. b,d | 14. a,b,c |
| 15. a,b,c,d | 16. a,b,d | | | | | |

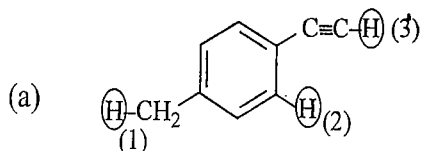
EXERCISE III

- | | | | | |
|-------|-------|------|------|-------|
| 1. 90 | 2. 65 | 3. 6 | 4. 6 | 5. 38 |
|-------|-------|------|------|-------|



One of the R.S. is having both ring aromatic.

- | | |
|----------------------------|--|
| 7. 6 | 8. (a) $3 > 2 > 4 > 1$ (b) $4 > 2 > 1 > 3 > 5$ |
| 9. $d < f < b < c < a < e$ | 10. 4 |
| 11. (a) $2 < 1 < 3$ | (b) $3 < 1 < 2$ |
| | (c) $3 < 1 < 2$ |



- (1) 3rd "H" is attached to sp hybridised "C" atom so is most acidic
 (2) 2nd "H" atom is attached to sp² hybridised "C" atom & 1st "C" atom attached to sp³ hybridised "C" atom. But anion formed is stabilised by resonance
 (b) 1st & 2nd "H" atom are present at "o" position to CoO group where 2nd is directly attached to "N" atom so is more Acidic which 3rd "H" is least. Acidic because the anion formed after

deprotonation is not stabilised by resonance

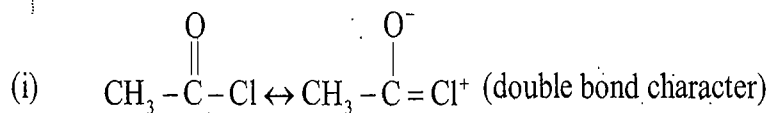
(c) 2nd & 1st "H" atoms are phenolic "H" atoms are more acidic than ketonic "α" "H" atom. But

2nd "H" is more acidic because -R of -C(=O)- group stabilised by resonance

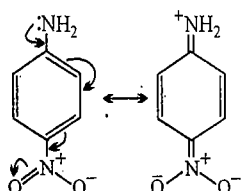
12.

4.

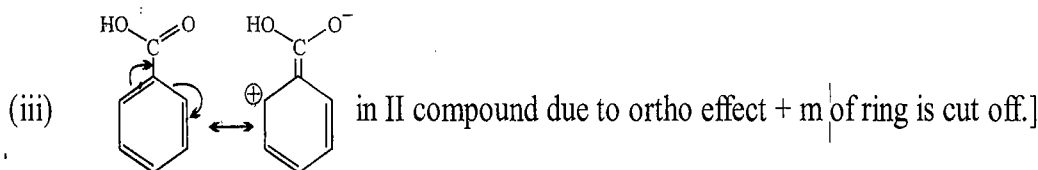
13.



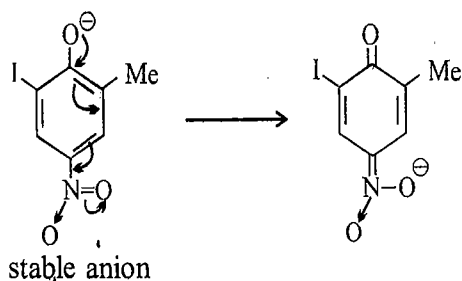
(ii)



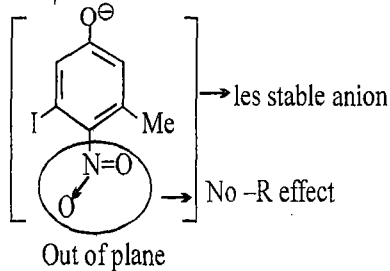
In 1st compound due to mesomeric effect more double bond character between C & N so that greater strength of bond.



14.



stable anion



EXERCISE IV

- | | | | | | | |
|-------|----------|-------------|-------|---------|-------|-------|
| 1. a | 2. b | 3. d | 4. c | 5. d | 6. b | 7. c |
| 8. a | 9. d | 10. d | 11. a | 12. c | 13. b | 14. b |
| 15. b | 16. a, c | 17. a, b, c | 18. 4 | 19. 160 | 20. a | 21. a |
| 22. a | 23. b | 24. c | 25. b | 26. c | 27. c | 28. a |
| 29. b | 30. a | 31. b | 32. c | 33. a | 34. a | 35. d |
| 36. d | 37. d | 38. a | 39. c | 40. a | 41. b | 42. c |
| 43. a | 44. c | | | | | |

SPECIFIC ROTATION

Specific rotation as optical rotation of 1 gm/mL concentrated solution when path length 10 cm (1 dm) at particular wavelength (λ) of light.

$$[\alpha] = \frac{\alpha}{c \cdot l}$$

Note: Most $[\alpha]$ values are quoted as $[\alpha]_D$ (where the D indicates the wavelength of 589 nm, the D line of a sodium lamp) or $[\alpha]_D^{20}$, the 20 indicating 20°C.

ENANTIOMERIC EXCESS

Enantiomeric excess or $e e$ is a measure for how much of one enantiomer is present compared to the other.

For example, in a sample with 40% $e e$ in R, the remaining 60% is racemic with 30% of R and 30% of S so that the total amount of R is 40% + 30% = 70%.

$$\% \text{ optically purity} = \frac{[\alpha]_{\text{obs}}}{[\alpha]_{\text{max}}} \times 100$$

assuming a linear relationship between $[\alpha]$ and concentration, which is true for most cases. The optical purity is equal to percent excess of one enantiomer over the other

So,

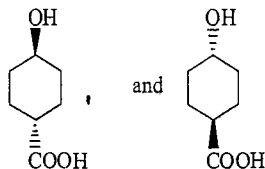
$$\text{Optical purity} = \text{percent enantiomeric excess} = \frac{[R] - [S]}{[R] + [S]} \times 100 = \%R - \%S$$

$$\text{Optical rotation} = \frac{e e}{100} \times \text{specific rotation}$$

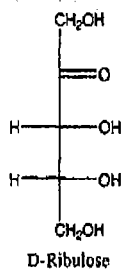
EXERCISE - I

Single Correct Type

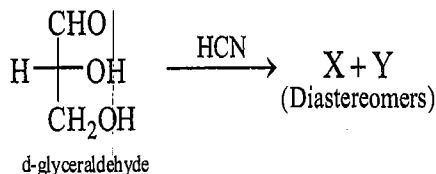
1. Which of the following does not possess any element of symmetry?
 (a) Ethane (b) (+) tartaric acid
 (c) Carbon tetrachloride (d) Mesotartaric acid
2. In 3 chloro-2 methyl pentane the priority sequence for fixing the R and S configuration is :
 (a) $-(\text{CH}_3)_2\text{CH}$, $-\text{C}_2\text{H}_5$, $-\text{Cl}$, H (b) $-(\text{CH}_3)_2\text{CH}$, $-\text{Cl}$, $-\text{C}_2\text{H}_5$, H
 (c) $-\text{Cl}$, $-(\text{CH}_3)_2\text{CH}$, $-\text{C}_2\text{H}_5$, H (d) $-\text{Cl}$, $-\text{C}_2\text{H}_5$, $-(\text{CH}_3)_2\text{CH}$, H
3. The compounds given below are :



- (a) Enantiomers (b) Identical (c) Regioisomers (d) Diastereomers
4. The compound if contains an even number 'n' of chiral carbons, but the molecule can be divided into two equal and similar halves, then how many optical active form it will have :
 (a) 2^n (b) $2^{(n-1)}$ (c) $2^{(n-2)/2}$ (d) $2^{(n-1)} - 2^{(n-1)/2}$
5. The absolute configuration at the two chiral centres in D-ribulose are



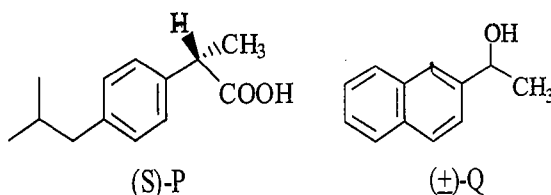
- (a) 3R, 4R (b) 3R, 4S (c) 3S, 4R (d) 3S, 4S
6. In the following reaction,



the absolute configurations of the chiral centres in X and Y are

- (a) 2S, 3R and 2R, 3R (b) 2R, 3R and 2R, 3S
 (c) 2S, 3S and 2R, 3R (d) 2S, 3R and 2S, 3R

7. Esterification of the acid P with the alcohol Q will give



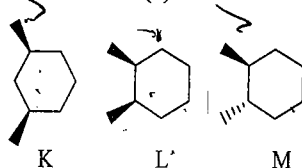
(a) only one enantiomer

(b) a mixture of diastereomers

(c) a mixture of enantiomers

(d) only one diastereomer

8. The molecule(s) that exist as meso structure(s)



check in chair conformation

is/are

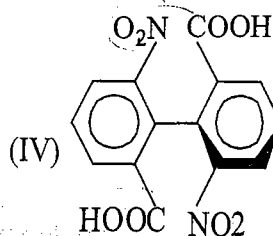
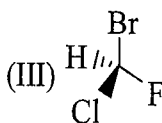
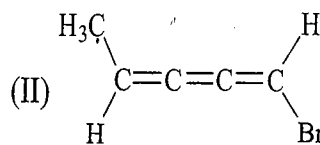
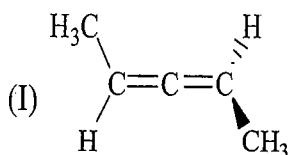
(a) only M

(b) both K and L

(c) Only L

(d) only K

9. Which of the following molecule is achiral

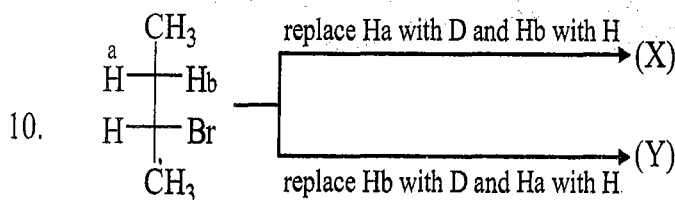


(a) I

(b) II

(c) III

(d) IV



relation between (X) and (Y) is

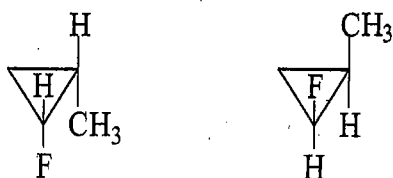
(a) Enantiomers

(b) Diastereomers

(c) E and Z isomers

(d) Constitutional isomers.

11. Molecules shown are



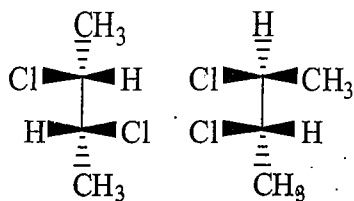
(a) Constitutional isomers

(b) Enantiomers

(c) Diastereomers

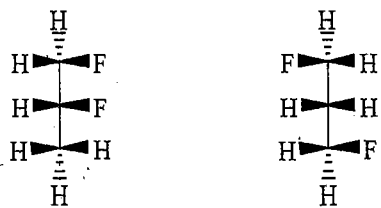
(d) Identical

12. The molecules shown are



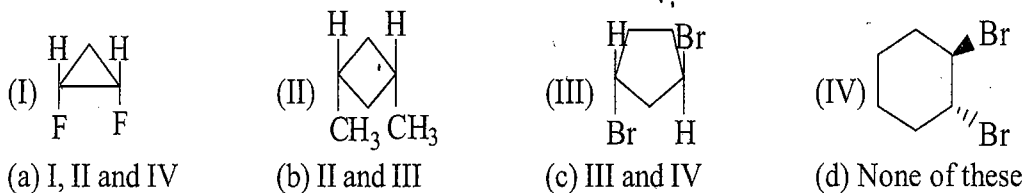
- (a) Enantiomers (b) Diastereomers
 (c) Constitutional isomers (d) Non isomers

13. The molecules shown are

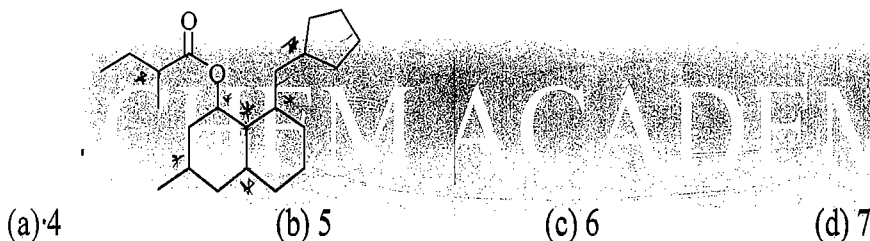


- (a) Constitutional isomer (b) enantiomers
 (c) Diastereomers (d) Identical isomers

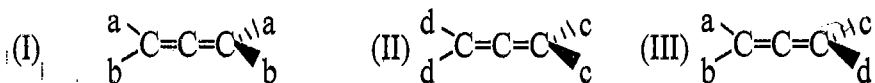
14. Which compound does not possess a plane of symmetry



15. Total number of chiral centre present in the given compound is



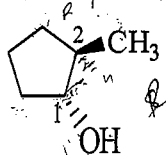
16. Which of the following compounds are optically active



a = OCH₃, b = NHCOCH₃, c = CH₃, d = CH₃CH₂

- (a) I only (b) III only (c) I and III (d) II and III

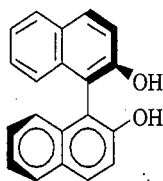
17. The structure of an optically active isomer of 2-methylcyclopentanol is shown below



The absolute configuration of this isomer is

- (a) 1R, 2R (b) 1S, 2S (c) 1S, 2R (d) 1R, 2S

18. The binaphthol 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

19. If the molecule having 60% optical purity of S enantiomer. What should be the total % of S and R enantiomer are present in the solution

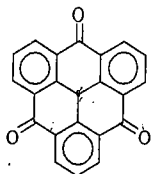
(a) 20% of S and 80% of R

(b) 60% of S and 40% of R

(c) 80% of S and 20% of R

(d) 40% of S and 60% of R

20. Which of the following is correct the given compound



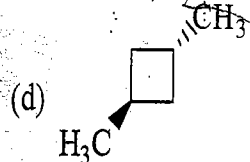
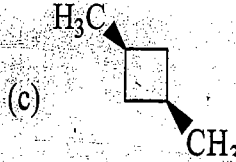
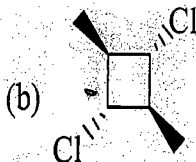
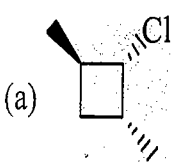
(a) It posses a centre of symmetry

(b) It posses C_4 axis of symmetry

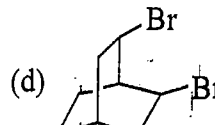
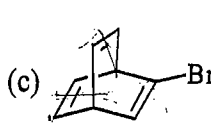
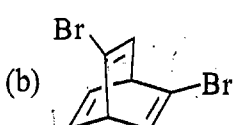
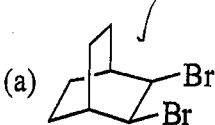
(c) Posses the plane of symmetry

(d) Compound is chiral

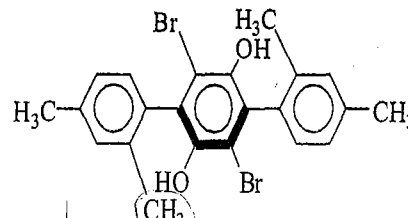
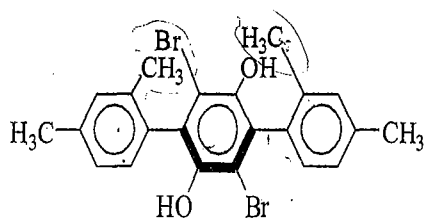
21. Which of the following compound is optically active



22. Among the following molecule, which one is chiral?



23. What is the configuration of these two compound



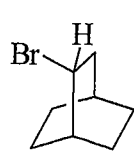
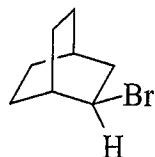
(a) cis, cis

(b) cis, trans

(c) trans, trans

(d) trans, cis

24. Relation between these two compound is



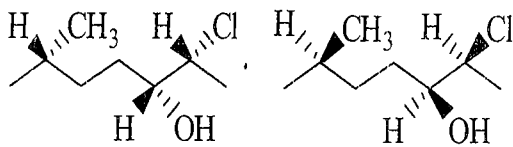
(a) constitutional isomer

(b) Enantiomers

(c) Identical

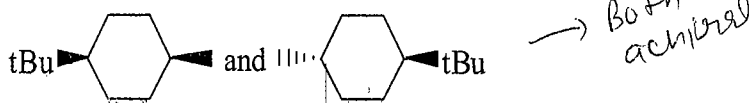
(d) Diastereomers

25. Relation between these two compound is *→ 2 chiral centre*



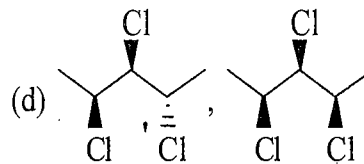
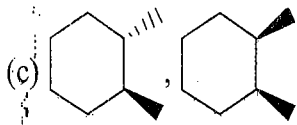
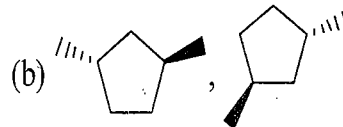
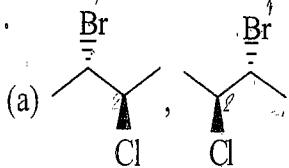
- (a) Enantiomers (b) Diastereomers (c) Identical (d) Constitutional isomers

26. What is the relation between these two compounds

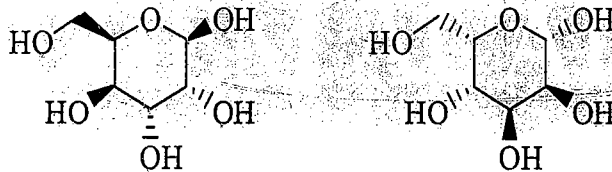


- (a) Enantiomers (b) Diastereomers (c) Identicals (d) None of these

27. Which of the following pair of compound is a pair of enantiomers

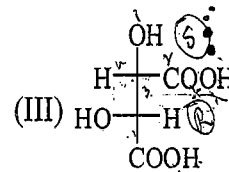
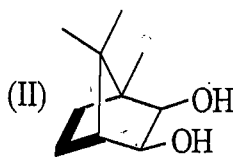
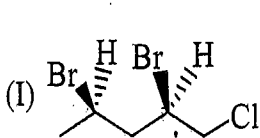


28. The following compound differ in respect of



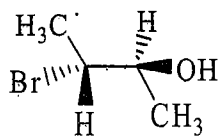
- (a) their chemical and physical properties (b) nothing
(c) the direction in which they rotate plane of polarization light
(d) their interaction with molecules

29. Which of the following molecules is chiral



- (a) I (b) II (c) III (d) I, II

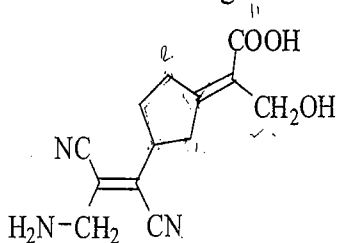
30. Fischer form of the following compound is



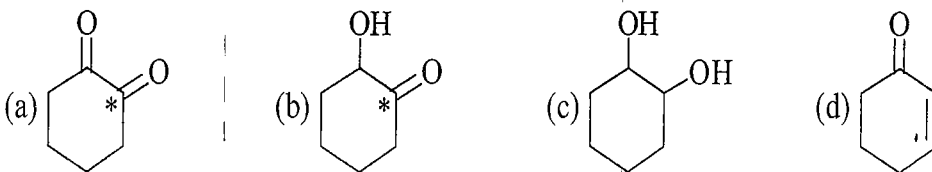
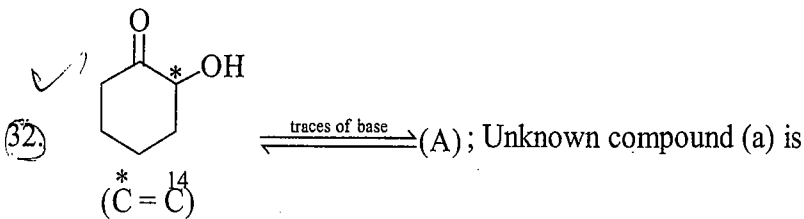
- (a) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{H} - \text{C} - \text{OH} \\ | \\ \text{H} - \text{C} - \text{Br} \\ | \\ \text{CH}_3 \end{array}$ (b) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{H} - \text{C} - \text{OH} \\ | \\ \text{Br} - \text{C} - \text{H} \\ | \\ \text{CH}_3 \end{array}$ (c) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{HO} - \text{C} - \text{H} \\ | \\ \text{H} - \text{C} - \text{Br} \\ | \\ \text{CH}_3 \end{array}$ (d) $\begin{array}{c} \text{OH} \\ | \\ \text{H} - \text{C} - \text{CH}_3 \\ | \\ \text{H} - \text{C} - \text{Br} \\ | \\ \text{CH}_3 \end{array}$

Assign double bond configurations to the following:

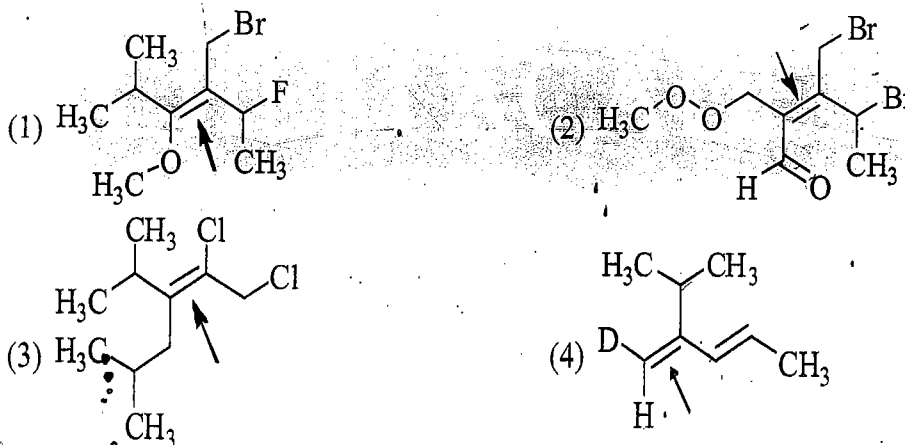
gmp



- (a) E (b) Z (c) E, E (d) Z, Z

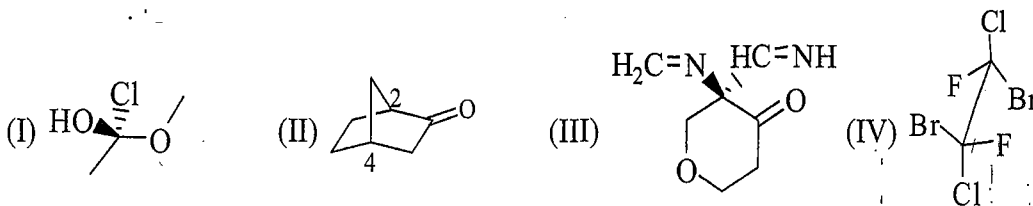


33. Among the following structures, select E isomers (arrows indicate the bonds to be considered)?



- gmp*
 (a) 1 and 2 (b) 1 and 3 (c) 1 and 4 (d) 2 and 3

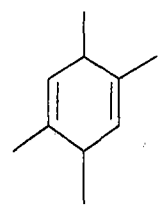
34. What is the absolute configuration of the following molecules? (NS = the molecule has no center)
 Note: For the purpose of this question only, the order of stereocenters is not specified; i.e., R, S = S, R.



- | | | | | | | | | | |
|-----|---|------|-----|----|-----|---|------|-----|------|
| | I | II | III | IV | | I | II | III | IV |
| (a) | R | R, S | R | NS | (b) | R | R, R | S | R, R |
| (c) | R | R, S | NS | NS | (d) | R | S, R | R | R, S |

35.

The number of all the possible stereoisomers formed by the given compound is:



check combinatorics of all stereoisomers

- (a) 2 (b) 3 (c) 32 (d) 64

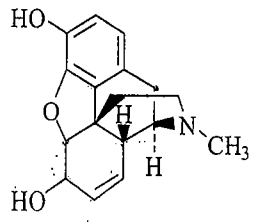
36. A solution of optically active 1-phenylethanol racemizes in acidified aqueous medium. It is due to

- (a) enolization (b) carbonium ion formation (c) carbanion formation (d) reversible oxidation-reduction

43.

37.

How many chiral center (excluding N centres) are there in morphine?



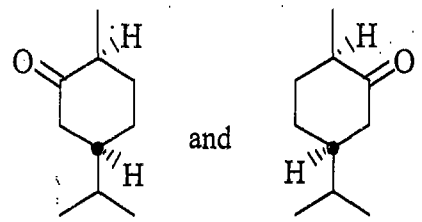
- (a) 4 (b) 5 (c) 6 (d) More than 6

44.

38. Ph-CH=NO2H isomerises over 3 days to (X), isomer (X) is

- (a) Ph-NO-CH2OH (b) Ph-CH2-NO2 (c) Ph-NH-CO2H (d) None

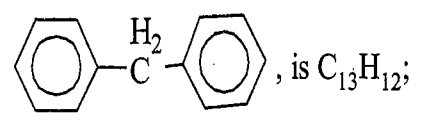
39. The two compounds shown below are:



- (a) diastereomers (b) enantiomers (c) epimers (d) regiomers

45.

40. The molecular formula of diphenylmethane,

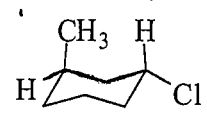


How many structural isomers are possible when one of the hydrogen is replaced by a chlorine atom?

- (a) 6 (b) 4 (c) 8 (d) 7

46.

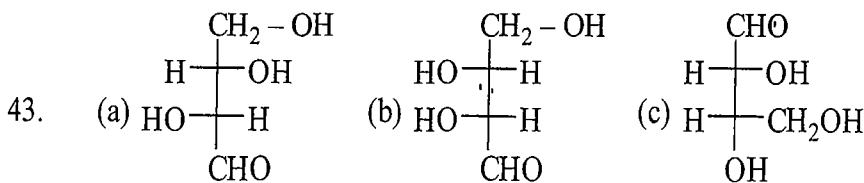
41. The stereochemistry of this molecule is:



- (a) 1R, 3R (b) 1R, 3S (c) 1S, 3S (d) 1S, 3R

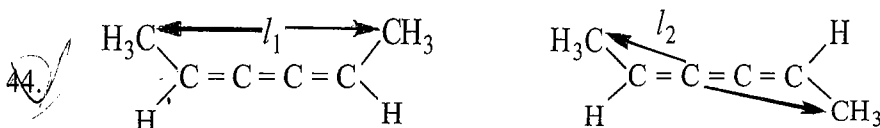
42. *gmp* Pure (S)-2-butanol has a specific rotation of +13.52 degrees. A sample of 2-butanol prepared in the lab and purified by distillation has a calculated specific rotation of +6.76 degrees. What can you conclude about the composition?

- (a) 50% (S), 50% impurity
 (b) 50% (S), 50% (R)
 (c) 50% (S), 50% racemic
 (d) Some other mixture



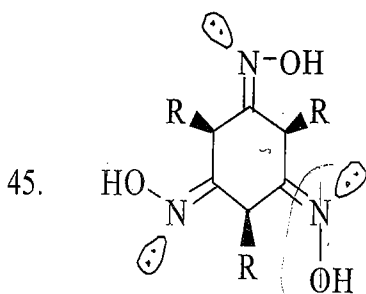
(D) & (L) configuration of above carbohydrate is

- (a) L, L, D
 (b) L, D, L
 (c) L, L, L
 (d) L, D, D

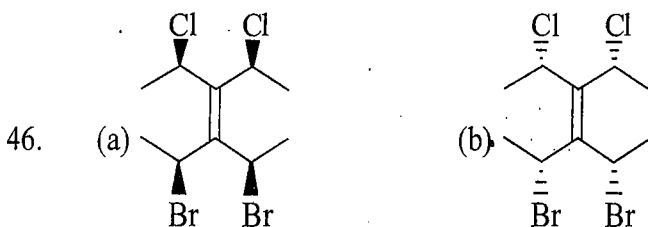


I and II are geometrical isomers of each other because

- (a) $l_1 = l_2$
 (b) $l_1 > l_2$
 (c) $l_2 > l_1$
 (d) l_1 and l_2 cannot be compared



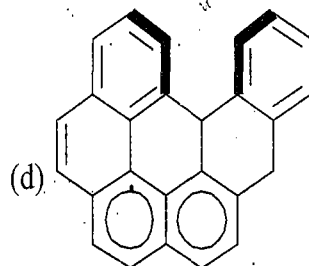
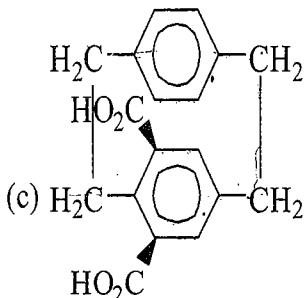
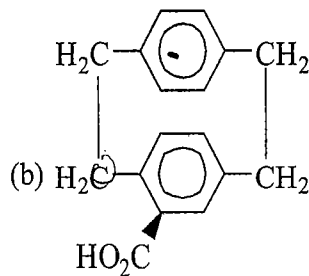
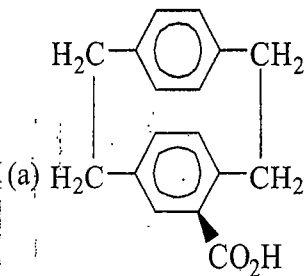
- (a) chiral
 (b) C_3 axis of symmetry
 (c) Optically active
 (d) All of these



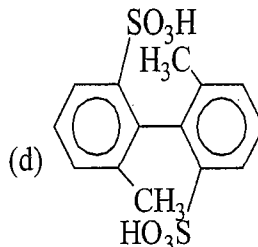
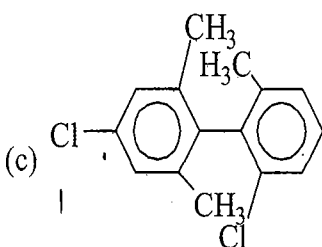
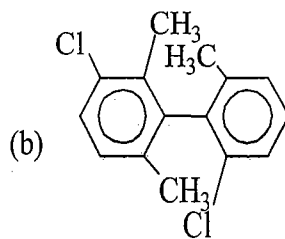
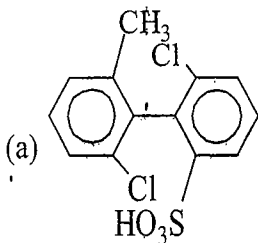
Relationship between above pair (a) & (b) is

- (a) Enantiomer
 (b) Diastereomers
 (c) Identical
 (d) Structural isomer

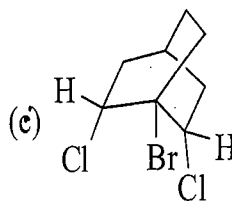
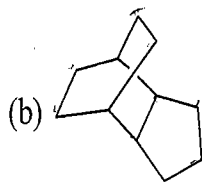
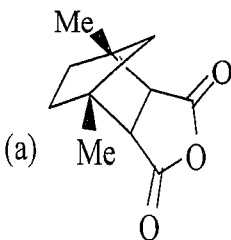
47. Which of the following is achiral?



48. Which of the following structure would not rotate plane polarized light?

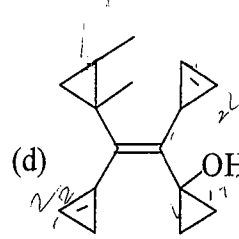
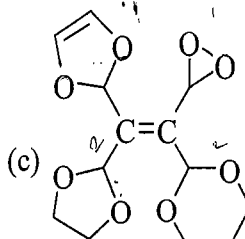
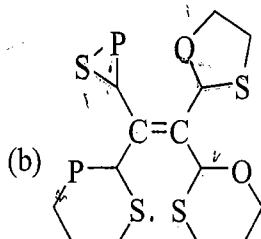
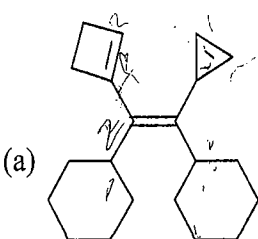


49. Which of following compound is achiral?

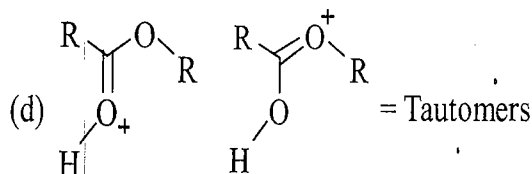
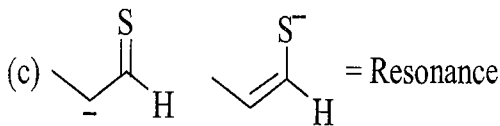
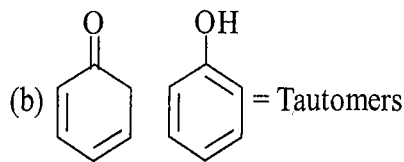
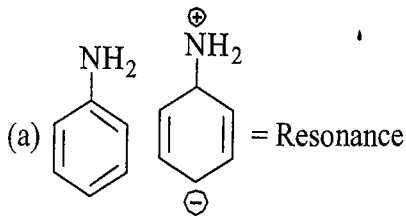


(d) All of these

50. Which of the following is E isomer?



51. Which of the following is incorrect relation between given pairs?



52. C_7H_7Cl shows how many benzenoid aromatic isomers?

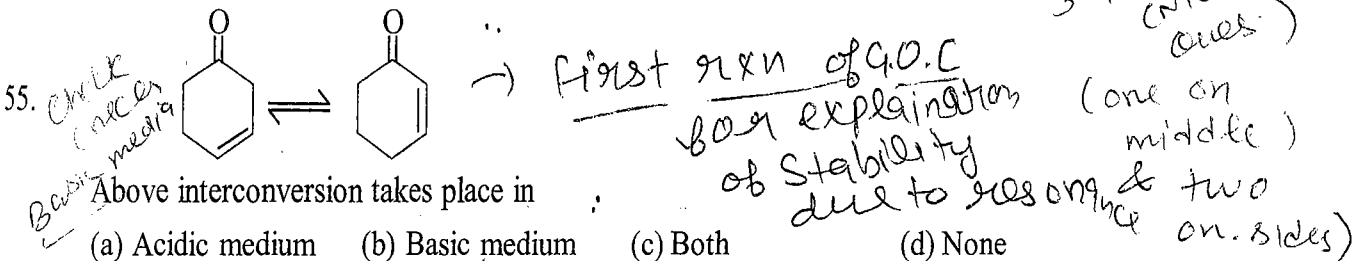
- (a) 4 (b) 3 (c) 5 (d) 6

53. How many structural isomers of C_5H_{10} are possible. *check once again*

- (a) 10 (b) 11 (c) 12 (d) 13

54. 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

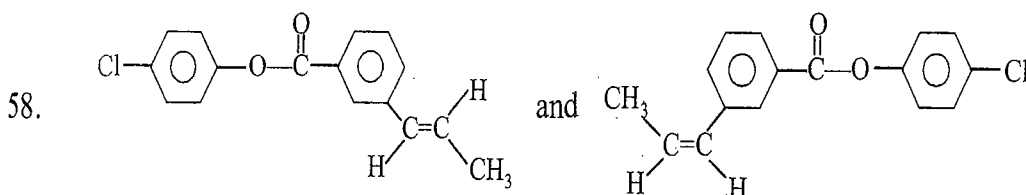


56. Which of the following cannot be written in an isomeric form?

- (a) $CH_3-CH(OH)-CH_2-CH_3$ (b) CH_3-CHO
 (c) $CH_2=CH-Cl$ (d) $Cl-CH_2CH_2-Cl$

57. 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



Shows which type of isomerism

- (a) Functional group isomerism (b) Geometrical isomerism
 (c) Metamerism (d) Position isomerism

58. The type of isomerism observed in urea molecule is

- (a) Chain (b) Position (c) Geometrical (d) Functional

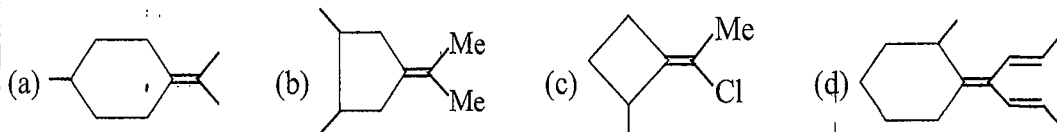
functional isomerism is a special type of functional isomerism

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



- (a) 2 (b) 4 (c) 6 (d) 8

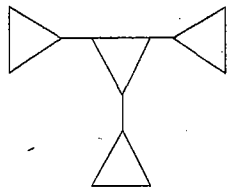
61. Which of the following will not show geometrical isomerism.



62. Which of the following will show geometrical isomerism.

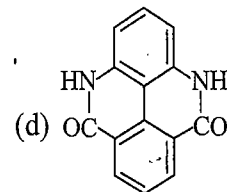
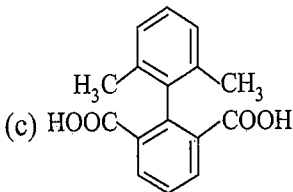
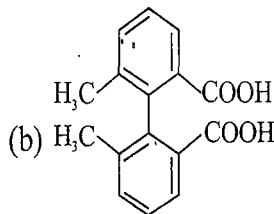
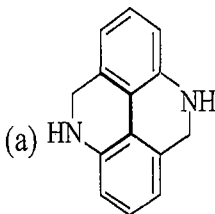


63. Total number of geometrical isomer of following compound is:



- (a) 2 (b) 3 (c) 4 (d) 5

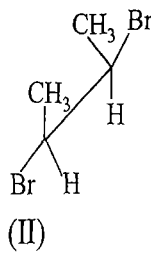
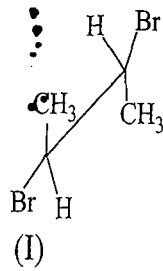
64. Select the optically active compound among the following :



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

- (a) positional isomers (b) enantiomers (c) diastereomers (d) racemic mixture

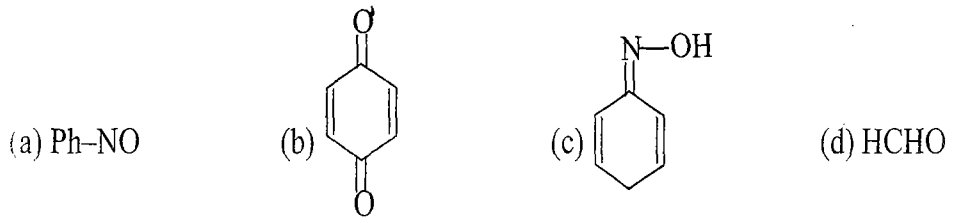
66. The structures shown here are related as being:



- (a) conformers (b) enantiomers
 (c) geometrical isomers (d) diastereoisomers

67. Number of possible 3D-isomers (stereoisomers) of glucose are
 (a) 10 (b) 14 (c) 16 (d) 20

68. Which compound show tautomerism

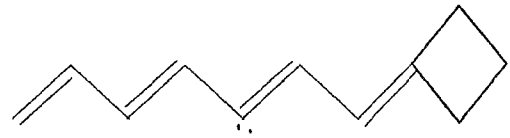


69. **Statement-1** : E-cyclopentadecene is having more ΔH_c (Heat of combustion) than Z isomer.

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

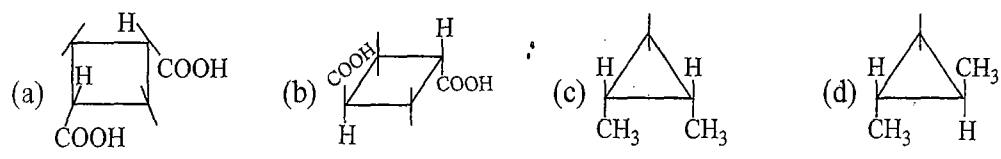
- (a) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
 (b) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
 (c) Statement-1 is true, statement-2 is false.
 (d) Statement-1 is false, statement-2 is true.

70. Total number of geometrical isomer of following compound.

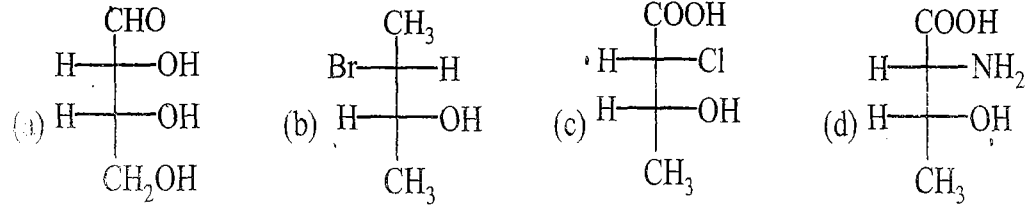


- (a) 2 (b) 4 (c) 8 (d) 16

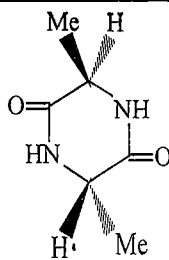
71. Which out of the following are resolvable.



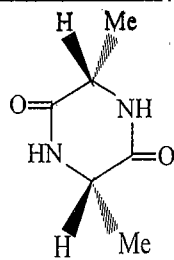
72. Which of the following is a 'threo' isomer?



73.



(A)



(B)

Statement 1 — A is optically active and B is optically inactive.

Statement 2 — A has a centre of symmetry

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

74.

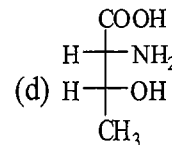
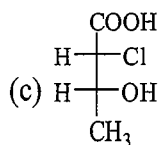
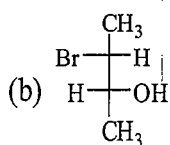
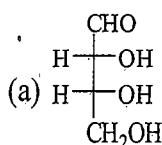
Optical rotation produced by $\begin{array}{c} \text{CH}_3 \\ | \\ \text{H}-\text{C}-\text{Cl} \\ | \\ \text{H} \end{array}$ is 36° then that product by $\begin{array}{c} \text{CH}_3 \\ | \\ \text{H}-\text{C}-\text{Cl} \\ | \\ \text{CH}_3 \end{array}$ is

75.

The optically active tartaric acid is named as D-(+)-tartaric acid because it has a positive

76.

Which of the following is a 'threo' isomer?



77.

Isomers which can be interconverted through rotation around a single bond are

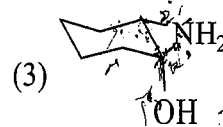
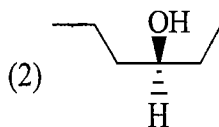
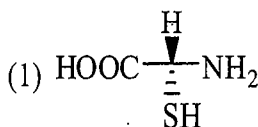
78.

The optically active tartaric acid is named as D-(+)-tartaric acid because it has a positive

- (a) optical rotation and is derived from D-glucose
 (b) pH in organic solvent
 (c) optical rotation and is derived from D-(+)-glyceraldehyde
 (d) optical rotation only when substituted by deuterium

79.

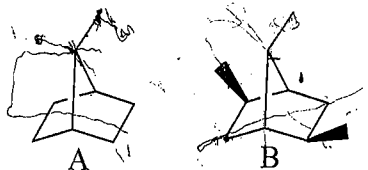
What are the configurations (R or S) of the chiral centers in the following molecules:



- (a) Compound 1 = R; Compound 2 = R; Compound 3 = 1S, 2S
 (b) Compound 1 = R; Compound 2 = S; Compound 3 = 1S, 2S
 (c) Compound 1 = S; Compound 2 = S; Compound 3 = 1S, 2R
 (d) Compound 1 = R; Compound 2 = R; Compound 3 = 1S, 2R

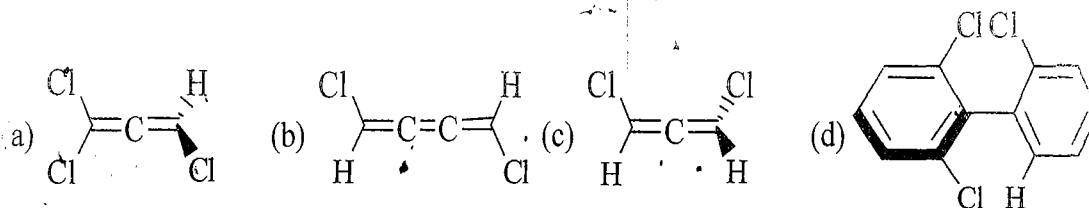
80.

What are the elements of symmetry present in the following molecules and which of them is chiral?

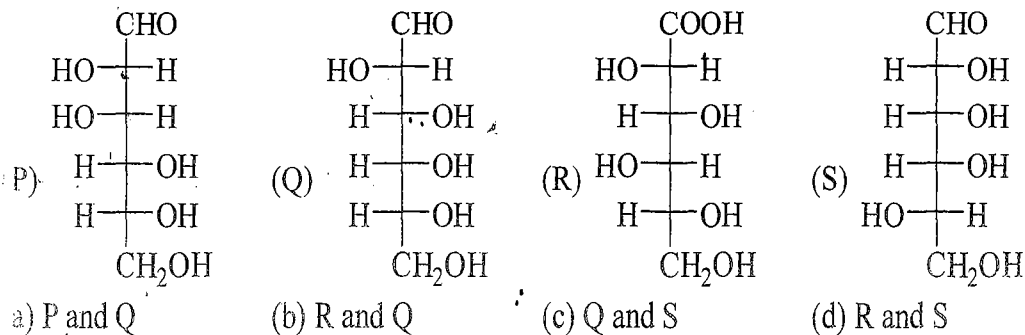


- (a) A has a 2-fold rotation axis and B has a plane of symmetry; A is chiral
 (b) A has a plane of symmetry and B has a centre of inversion; B is chiral
 (c) A has a plane of symmetry and B has a 2-fold rotation axis; A is chiral
 (d) A has a plane of symmetry and B has a 2-fold rotation axis; B is chiral

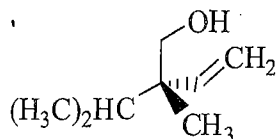
81. Which one among the following molecules is chiral?



82. The correct epimeric pair of the following is

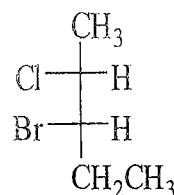
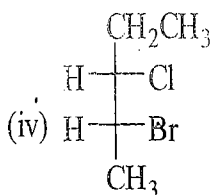
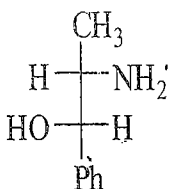
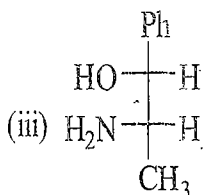
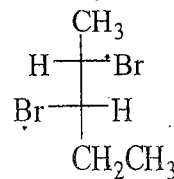
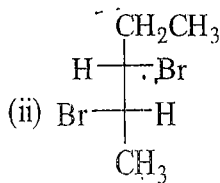
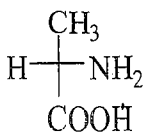
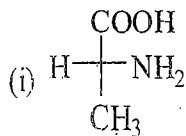


83. The Cahn-Ingold-Prelog (CIP) priorities of the groups and the absolute configuration (R/S) of the following compound are



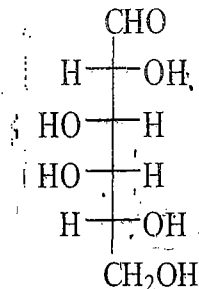
- (a) $\text{CH}_2\text{OH} > \text{CH}(\text{CH}_3)_2 > \text{CH} = \text{CH}_2 > \text{CH}_3$ and S
 (b) $\text{CH}_2\text{OH} > \text{CH} = \text{CH}_2 > \text{CH}(\text{CH}_3)_2 > \text{CH}_3$ and S
 (c) $\text{CH}_2\text{OH} > \text{CH} = \text{CH}_2 > \text{CH}(\text{CH}_3)_2 > \text{CH}_3$ and R
 (d) $\text{CH}_2\text{OH} > \text{CH}(\text{CH}_3)_2 > \text{CH} = \text{CH}_2 > \text{CH}_3$ and R

84. The correct sequence of relationship between the compounds of the following pairs i-iv is

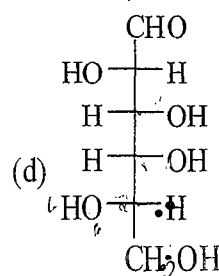
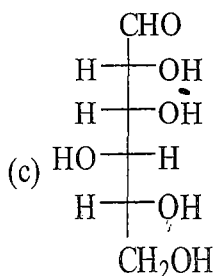
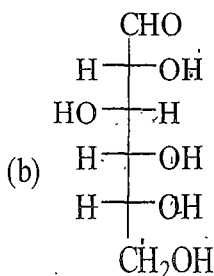
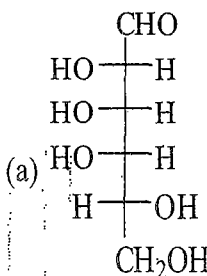


- (a) Identical, enantiomers, diastereomers and structural isomers
 (b) enantiomers, identical structural isomers and diastereomers
 (c) enantiomers, identical diastereomers and structural isomers
 (d) identical, identical, diastereomers and structural isomers

85. The structure of D-galactose is



Which one of these structures is L-galactose?



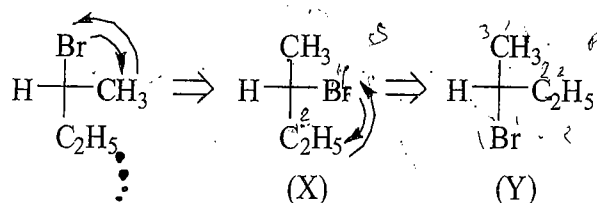
86. The maximum number of stereoisomers possible for 4-phenylbut-3-en-2-ol is

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

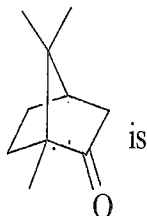
87. Among the following, the correct statement concerning the optical activity is

- (a) a molecule containing two or more chiral centres is always optically active
 (b) a molecule containing just one chiral centre is always optically active ✓
 (c) a molecule possessing alternating axis of symmetry is optically active
 (d) an optically active molecule should have at least one chiral centre

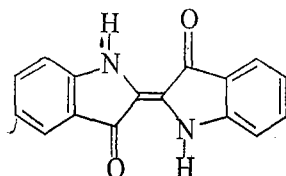
88. After the following interchanges of groups in the Fischer projection of 2-bromobutane, the configuration of (X) and (Y) will be



- (a) X = R; Y = S (b) X = R; Y = R (c) X = S; Y = R (d) X = S; Y = S
89. The number of enantiomers of camphor

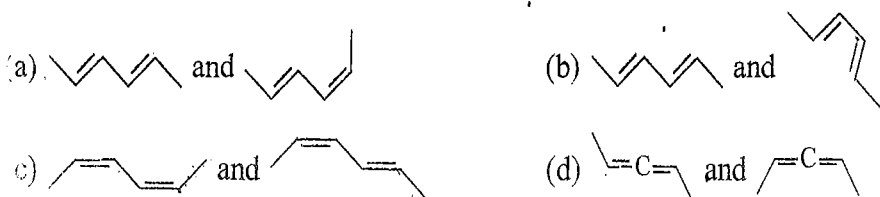


- (a) Four (b) Three (c) Two (d) One
90. **Statement 1 :** Trans isomer of indigotin is more stable w.r.t cis isomer.

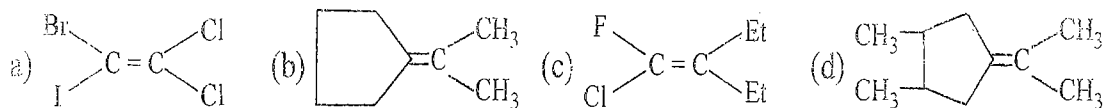


Statement 2 : There is no repulsion between lone pairs of oxygen in trans form.

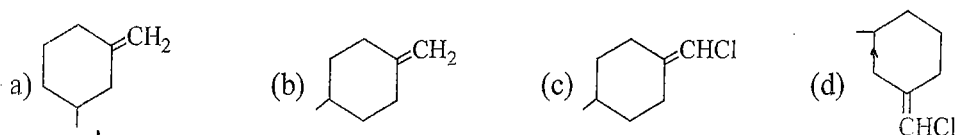
- (a) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
 (b) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
 (c) Statement-1 is false, statement-2 is true.
 (d) Statement-1 is true, statement-2 is false.
91. Which of the following pairs of structures represent conformational isomers?

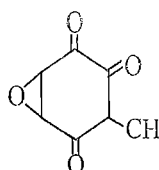


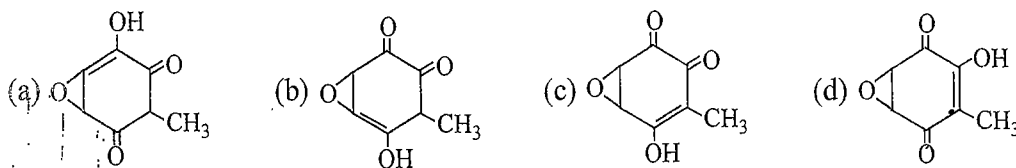
92. Which of the following compound can show geometrical isomerism.



93. The geometrical isomerism is shown by

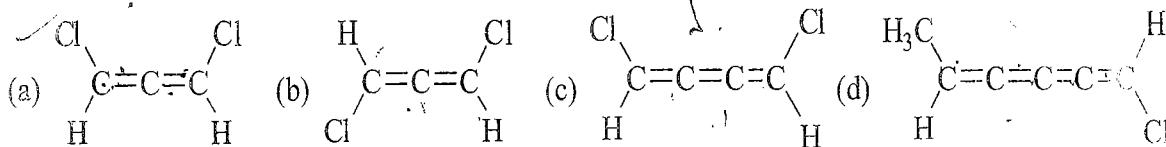


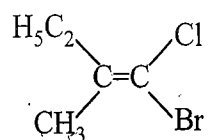
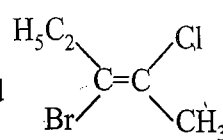
94. The most stable enol-form of compound  is



95. Conformational changes in a molecule leads to change in
 (a) torsional angle (b) bond angle (c) bond length (d) all of the above

96. The achiral molecule among the following is

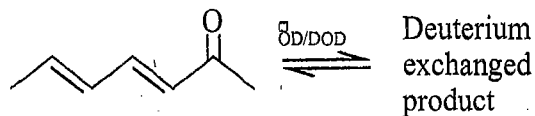


97. **Statement 1 :**  and  are structural isomers.

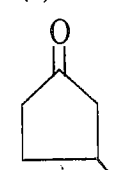
Statement 2 : The above mentioned compounds can show geometrical isomerism.

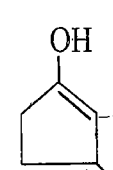
- (a) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
 (b) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
 (c) Statement-1 is false, statement-2 is true.
 (d) Statement-1 is true, statement-2 is false.

98. How many H (Hydrogens) will be replaced by D (Deuterium) in given compound after long time



- (a) 3 (b) 6 (c) 10 (d) 8

99. **Statement-1 :**  tautomer of this compound can show geometrical isomer.

Statement-2 :  across the double bond both the terminals having different groups.

- (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.

100. **Statement-1** : Boat form is the least stable conformation of cyclohexane.

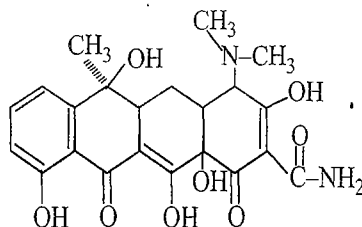
Statement-2 : Boat form is eclipsed form.

- (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.

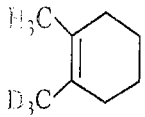
101. Which is the most stable conformer of glycol in H_2O

- (a) anti (b) gauche (c) eclipsed (d) fully eclipsed

102. Tetracycline is called a broad spectrum antibiotic because it active against a wide variety of bacteria. How many chirality center does tetracycline have?

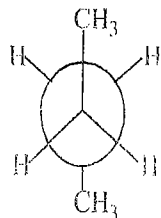


- (a) 3 (b) 4 (c) 5 (d) 6

103.  This compound shows:

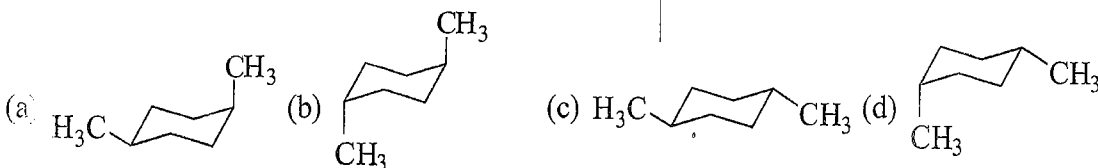
- (a) geometrical isomerism (b) optical isomerism
 (c) both (d) none

104. One of the configuration of n-butane is drawn in the given figure. Anticlockwise rotation of C_2 around C_2-C_3 bond by 120° will lead to

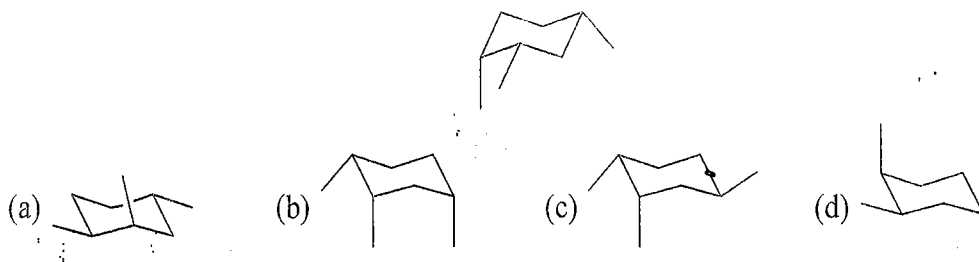


- (a) gauche (b) staggered (c) partially eclipsed (d) fully eclipsed

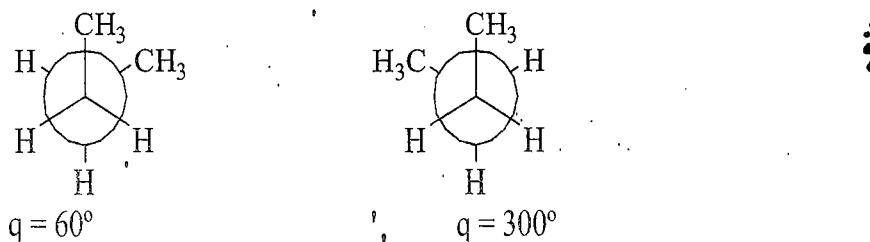
105. The stable form of trans 1,4-dimethyl cyclo hexane is represented by



106. Which of the structure will be produced if a ring flip occurs in the following compound in chair form.



107. What is the relation between of n-butane having dihedral angle are $\theta = 60^\circ$ and $\theta = 300^\circ$

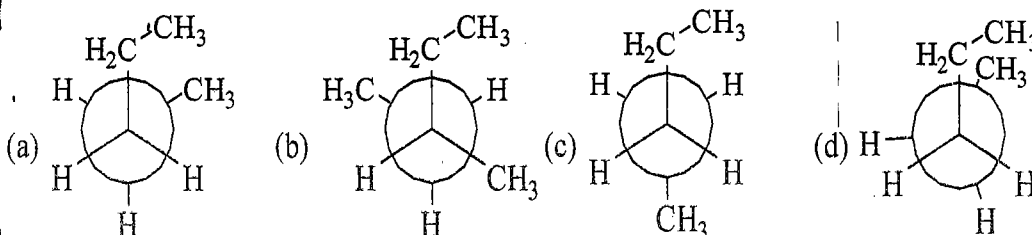


(a) Enantiomers (b) Diastereomers (c) Identicals (d) None of these

108. Which should be the most stable form of cyclohexane



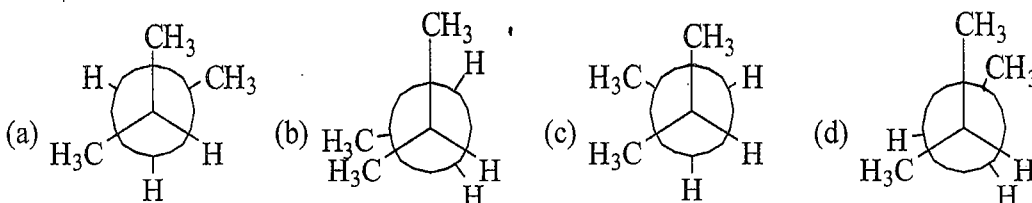
109. Identify the stable conformation of pentane



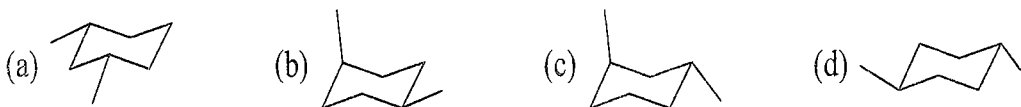
110. Which of the following form stable for $\text{OH} - \text{CH}_2 - \text{CH}_2 - \text{F}$

(a) staggered form (b) Partially eclipsed (c) Gauche form (d) Eclipsed form

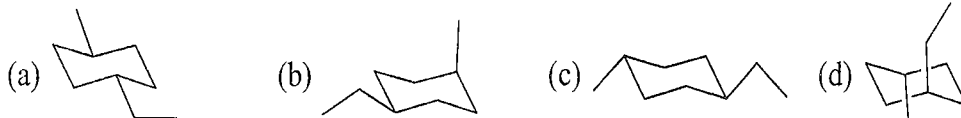
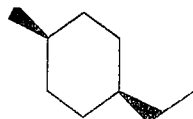
111. Most stable conformation of 2-methyl butane is



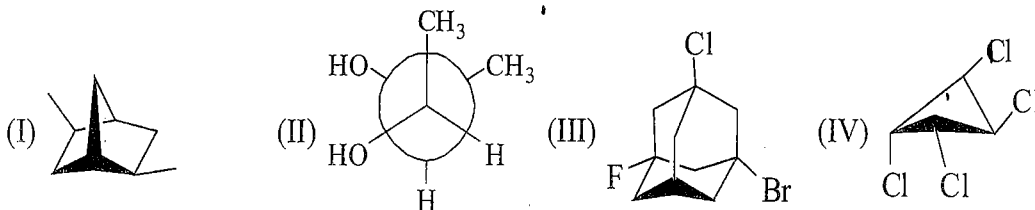
112. Which of the following compounds is most stable?



113. Which is the most stable chair form of this compound?

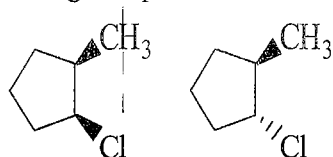


114. Which of the following molecules are chiral?



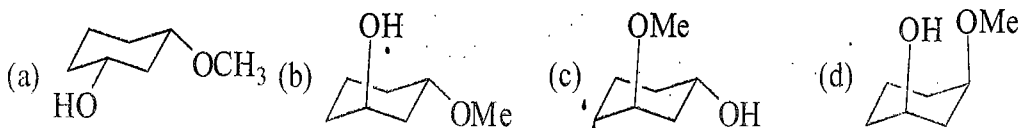
(a) I, III and IV (b) II, III and IV (c) II and IV (d) I and II

115. The following compounds are identical with respect to:

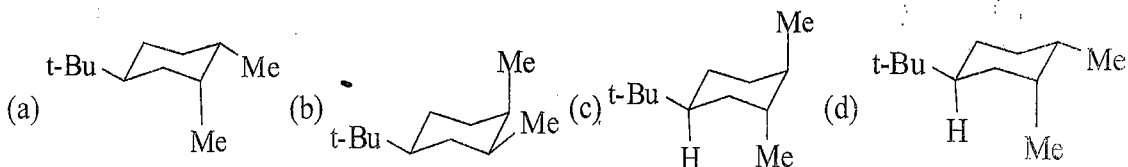
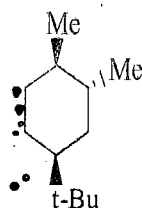


(a) Molecular composition (b) boiling point
(c) melting point (d) IUPAC name

116. Among the following, the most stable isomer is



117. The most stable conformation of the following compound is:



118. Which of the following molecules have non-zero dipole moments?

(I) gauche conformation of 1, 2-dibromoethane

(II) anti conformation of 1, 2-dibromoethane

(III) trans-1, 4-dibromocyclohexane

(IV) cis-1, 4-dibromocyclohexane

(V) tetrabromomethane

(VI) 1, 1-dibromocyclohexane

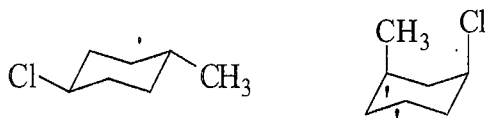
(a) I and II

(b) I and IV

(c) II and V

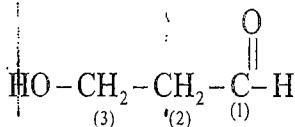
(d) I, IV and VI

119. What is the relationship between the two structures shown?



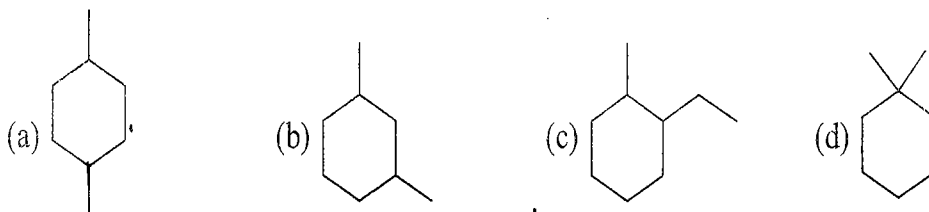
- (a) Constitutional isomers
 (b) Stereoisomers
 (c) Different drawing of the same conformation of the same compound
 (d) Different conformation of the same compound

120.

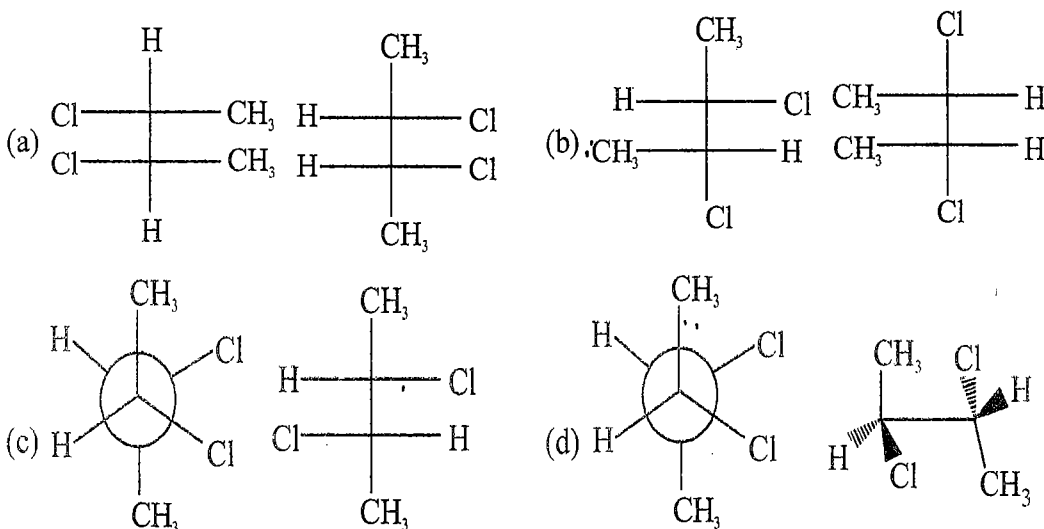


Which conformer of above compound is most stable
 (consider conformer across (C₂ - C₃))

- (a) Staggered (b) Gauche (c) Fully eclipsed (d) Partially eclipsed
121. Which of the following compound has one of the stereoisomers as a meso compound?



122. Identify diastereoisomer in the following are :



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

- (a) Eclipse, gauche, anti
 (b) Gauche, eclipse, anti
 (c) Eclipse, anti, gauche
 (d) Anti, gauche, eclipse

124. The

(a)

125. In

CH

(a)

126. W

(a)

(c)

127. In

the

(a)

(c)

128. A

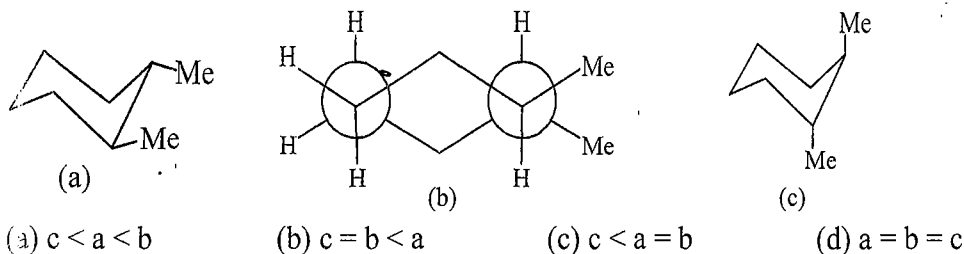
(a)

129. T

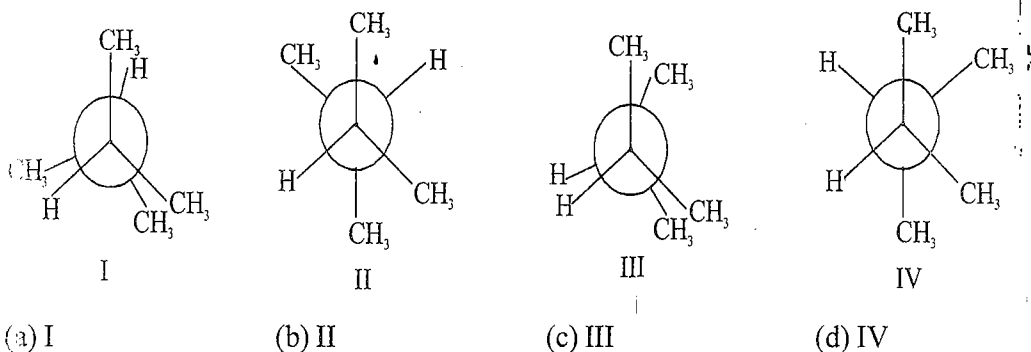
(a)

(c)

124. The correct stability order of the following species is



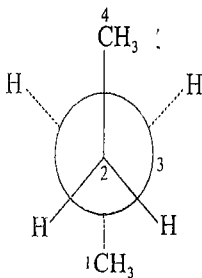
125. In which of the following has minimum torsional strain and minimum Vander waal strain.



126. When cyclohexane is poured on water, it floats, because:

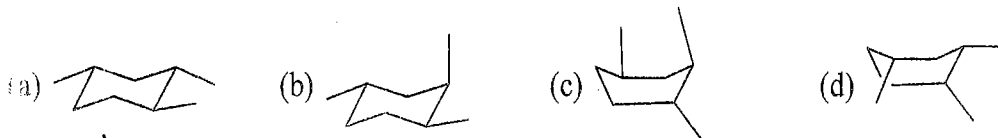
- (a) cyclohexane is in 'boat' form (b) cyclohexane is in 'chair' form
 (c) cyclohexane is in 'crown' form (d) cyclohexane is less dense than water

127. In the given conformation, if C_2 is rotated about C_2-C_3 bond anticlockwise by an angle of 120° then the conformation obtained is



- (a) fully eclipsed conformation (b) partially eclipsed conformation
 (c) gauche conformation (d) staggered conformation

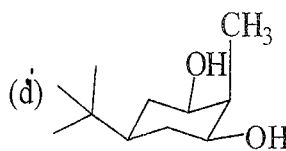
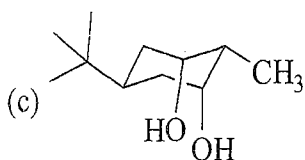
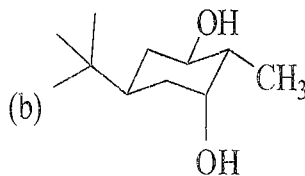
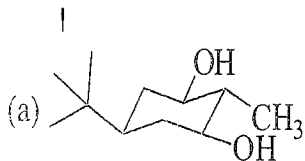
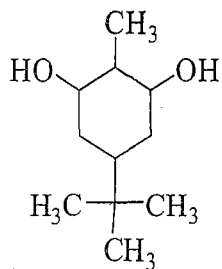
128. Among the structure shown below, which are lowest potential energy?



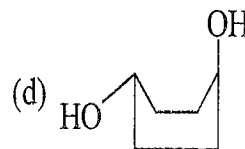
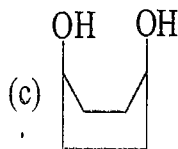
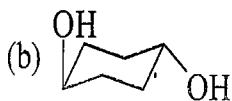
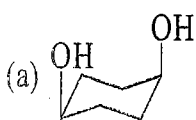
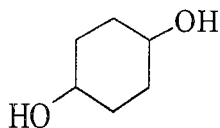
129. The pair of conformation that has maximum energy difference is



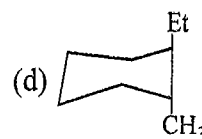
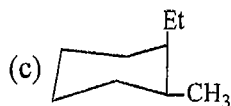
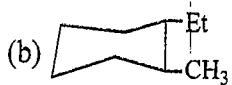
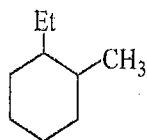
130. The optically active stereoisomer of the following compound is



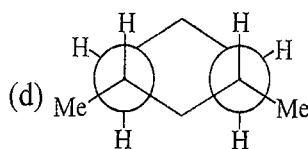
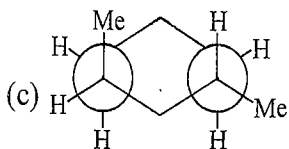
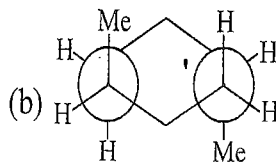
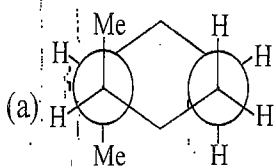
131. The most stable conformation of the molecule shown below is correctly represented by



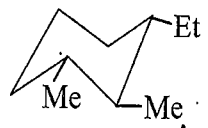
132. Identify most stable form of given compound



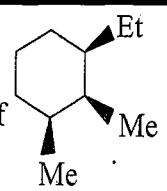
133. Which of the following isomeric structure have lowest energy?



134. **Statement-1** :



is most stable conformer of



Statement-2 :

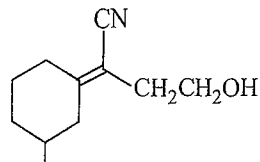
Torsional strain and flag pole interactions cause the boat conformation to have considerably higher energy than the chair conformation.

- (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.
135. The order of stability of the different conformation of cyclohexane is :
- (a) Chair form > boat form > twist boat form
 - (b) Chair form > twist boat form > boat form
 - (c) Twist boat form > boat form > chair form
 - (d) Boat form > chair form > twist boat form

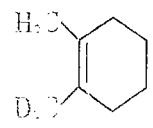
EXERCISE - II

Multiple Answer Type

1. True statement(s) about the following compound is/are



- (a) It shows geometrical isomerism
- (b) It shows optical isomerism
- (c) Its configuration is E
- (d) It is having three chiral centers

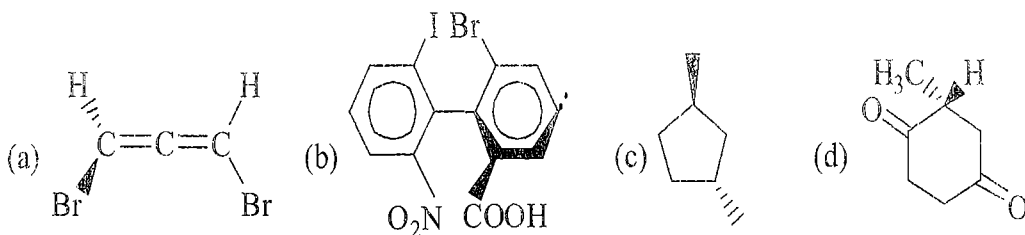
2.  compound does not show:

- (a) geometrical isomerism
- (b) optical isomerism
- (c) enantiomer
- (d) meso compound

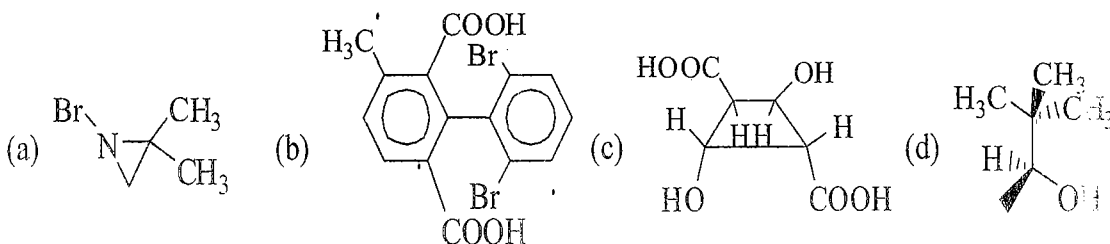
3. Which of the following compounds has a stereoisomer that is a meso compound?

- (a) 2,4-dibromohexane
- (b) 2,3-dibromobutane
- (c) 2,4-dimethylpentane
- (d) hexane-2,5-diol

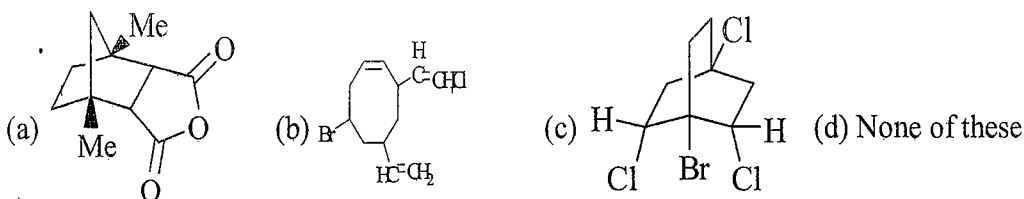
4. Which of the following molecules is (are) chiral?



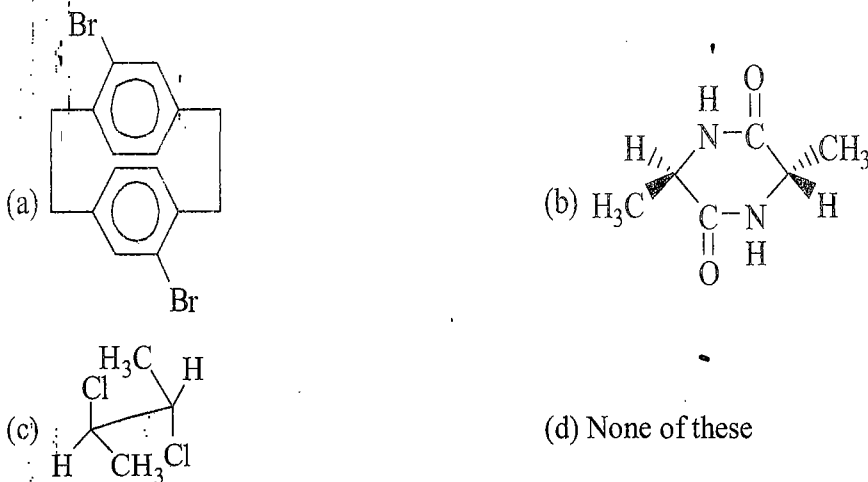
5. Which of the following molecules are not optically active



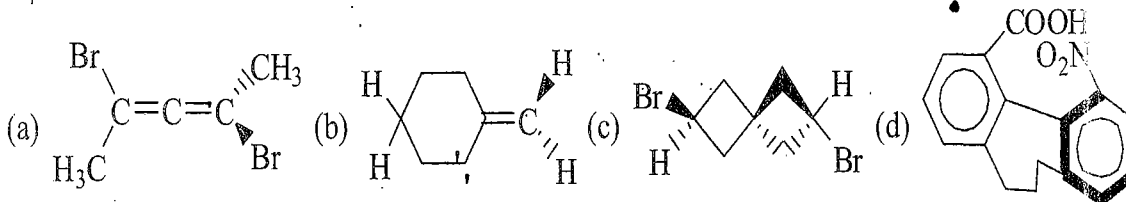
6. Which of the following compounds is achiral



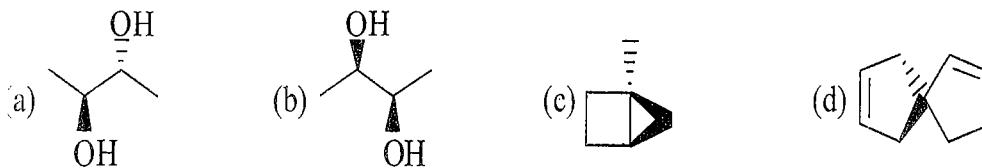
7. Which of the following compound has centre of symmetry



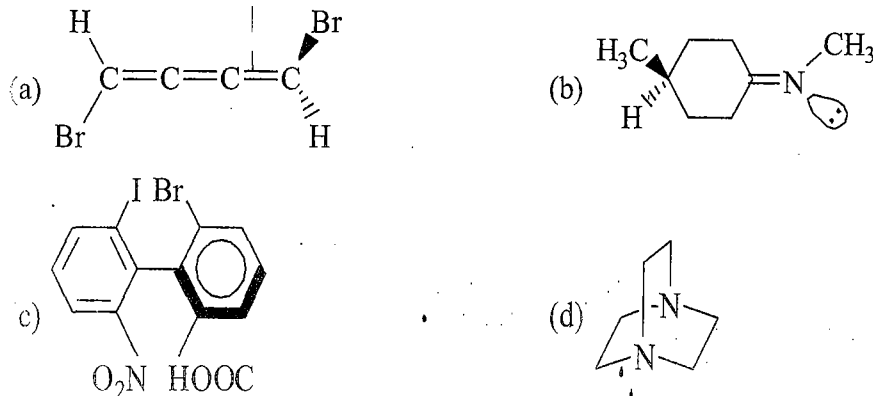
8. Which of the following compound is/are optically active



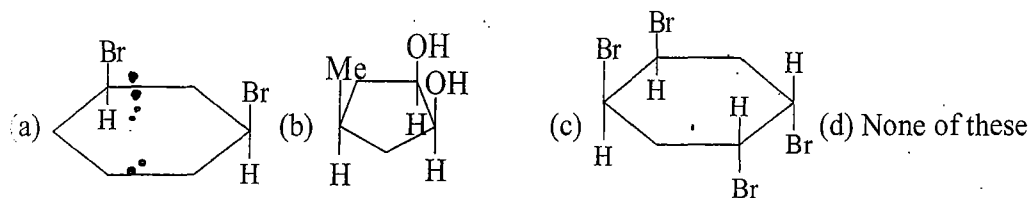
9. Which of the following compounds are chiral?



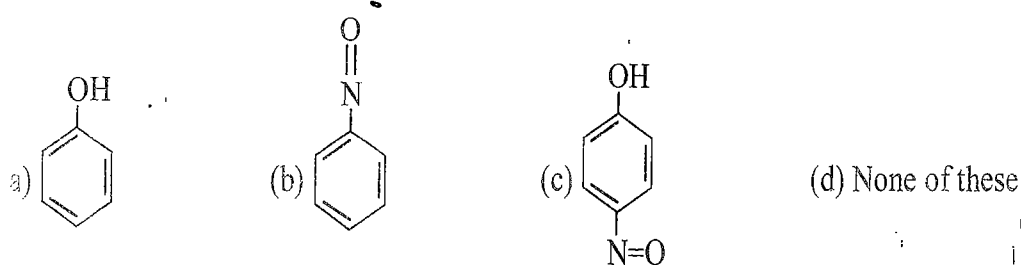
10. Which of the following molecules are optically active.



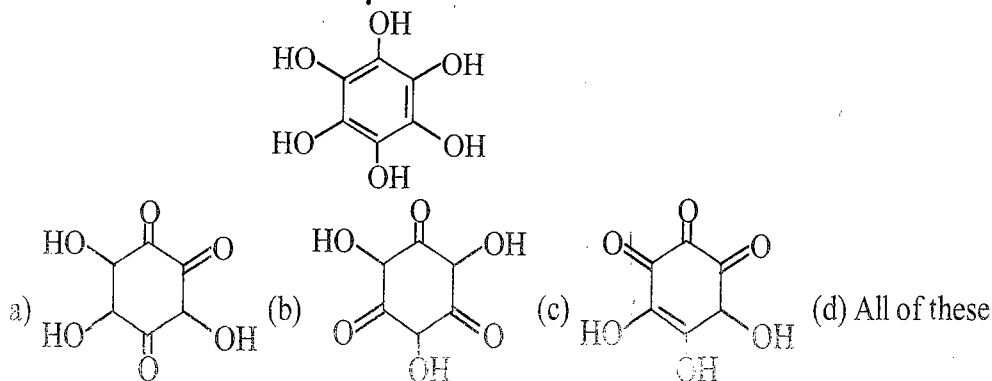
11. Which of the following compound is non-resolvable (meso) compound?



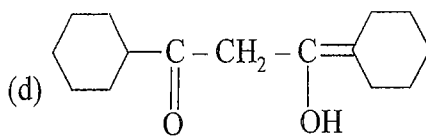
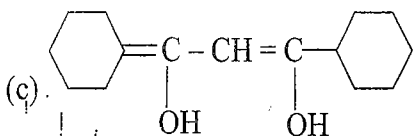
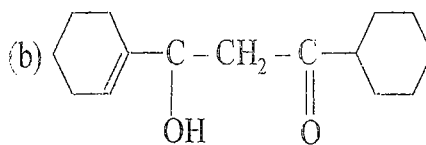
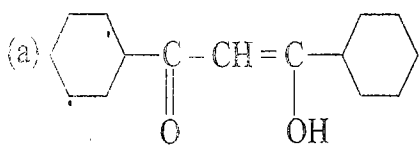
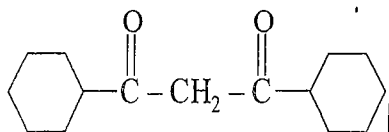
12. Which compound show tautomerism:



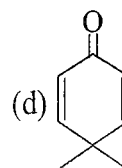
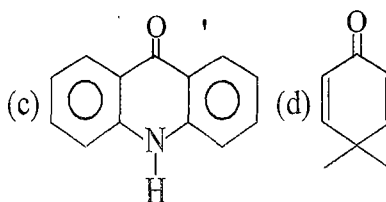
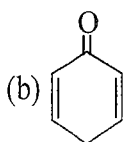
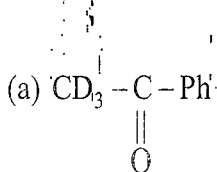
13. Tautomerism form of this compound is/are:



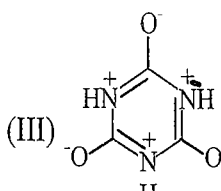
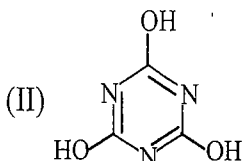
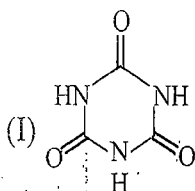
14. Tautomer of following compound is :



15. Which of the following can tautomerise.



16. What is relation between (I), (II) and (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

17. Which of the following statements is/are not correct?

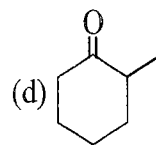
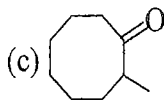
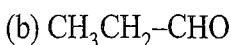
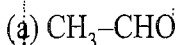
(a) Metamerism belongs to the category of structural isomerism

(b) Tautomeric structures are the resonating structures of a molecule

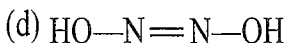
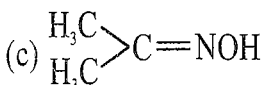
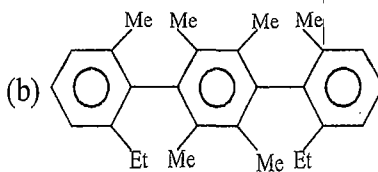
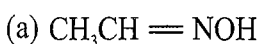
(c) Keto form is always more stable than the enol form

(d) Geometrical isomerism is shown only by alkenes

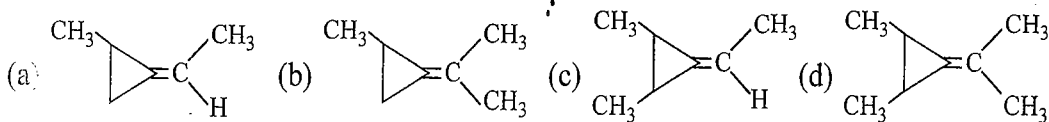
18. Tautomer of which of the following can show geometrical isomerism



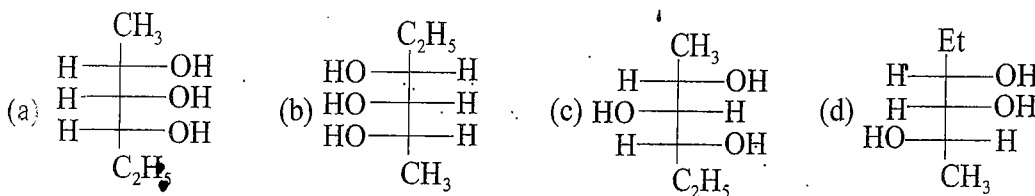
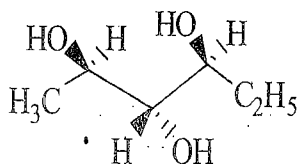
19. Which will show geometrical isomerism ?



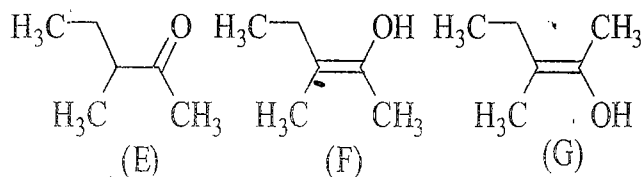
20. Which of the following have zero dipole moment?
 (a) p-Dichlorobenzene (b) Benzene-1, 4-diol
 (c) Fumaric acid (d) Maleic acid
21. Which of the following will show optical isomerism as well as geometrical isomerism.



22. 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.
23. 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) Alcohol and ether are functional isomers
24. Which of the following is/are the correct Fischer projection of the following :

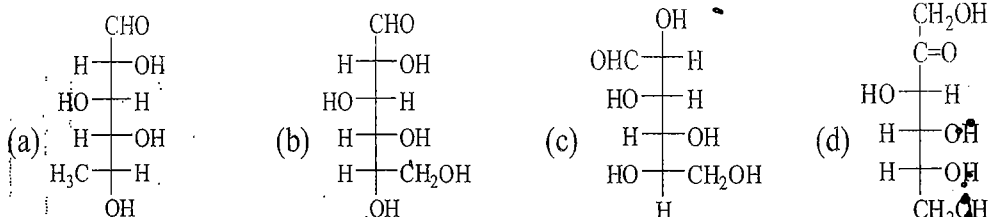


25. The correct statement(s) concerning the structures E, F and G is (are)

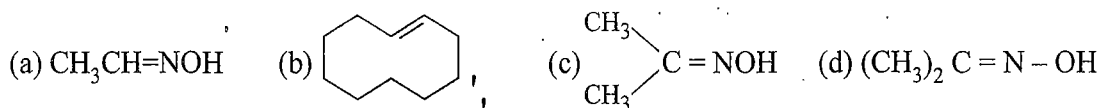


- (a) E, F and G are resonance structures (b) E, F and E, G are tautomers
 (c) F and G are geometrical isomers (d) F and G are diastereomers

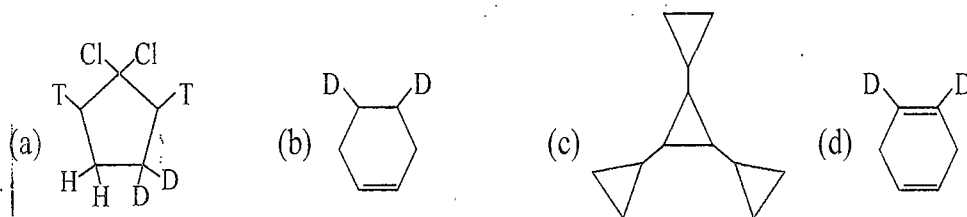
26. The correct statement(s) about the compound $H_3C(HO)HC - CH = CH - CH(OH)CH_3$ (X) is(are)
- (a) The total number of stereoisomers possible for X is 6.
 (b) The total number of diastereomers possible for X is 3.
 (c) If the stereochemistry about the double bond in X is trans, the number of enantiomers possible for X is 4.
 (d) If the stereochemistry about the double bond in X is cis, the number of enantiomers possible for X is 2.
27. Which of the following are D sugars:



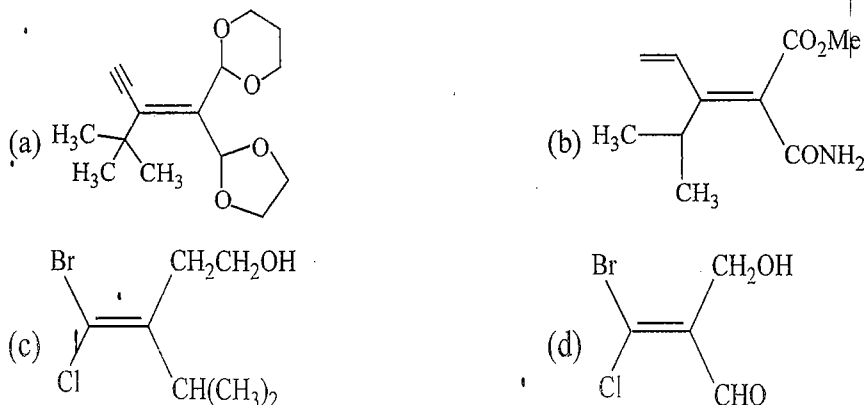
28. Which will show geometrical isomerism?



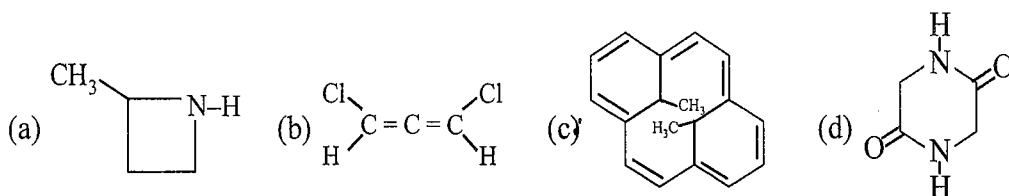
29. Which will show geometrical isomerism.



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

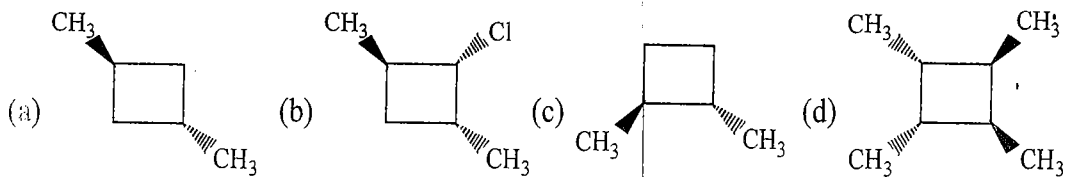


31. Which compound(s) will show the geometrical isomerism?



(C) is(are)

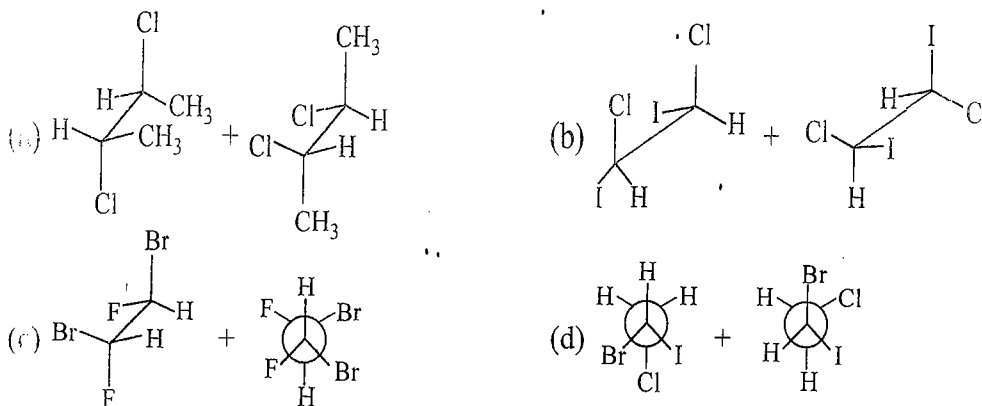
32. Out of the following which are chiral



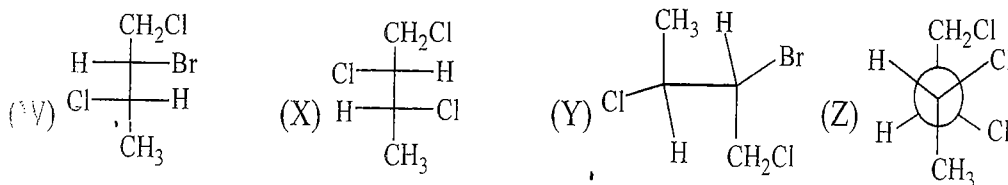
possible

sible for

33. Which of the following pairs of compounds are not identical?



34. Consider the following statements regarding the given projection and select the correct statement(s)?



(a) W & Y are diastereoisomers

(b) Z is the newmann projection of X

(c) W, X, Y and Z are optically active

(d) Y & Z are meso.

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

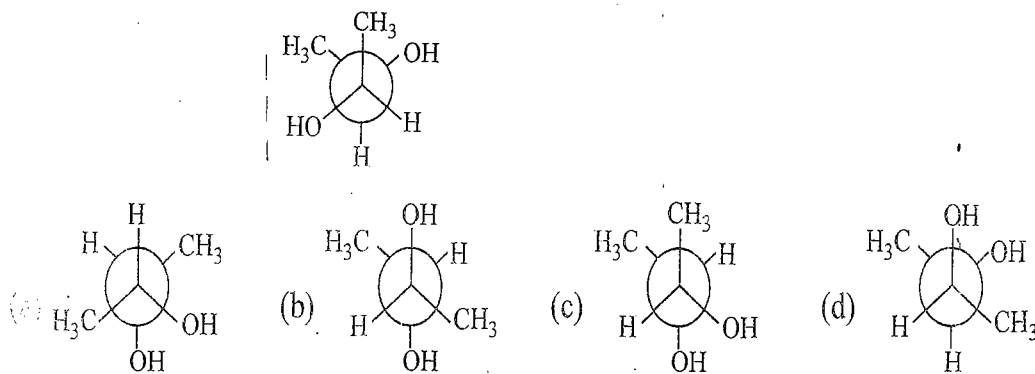
(a) fully eclipsed

(b) Gauche

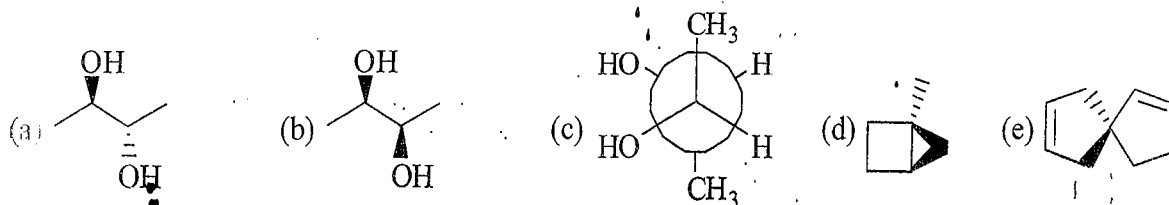
(c) Partially eclipsed

(d) Anti

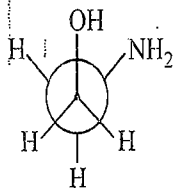
36. Which of the following molecules is/are identical with that represented by



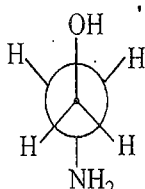
37. Which of the following molecules are chiral?



38.



(a)



(b)

(a) a & b have equal torsional strain

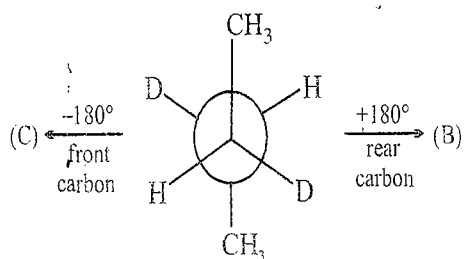
(b) a is more stable

(c) a is having higher dipole moment

(d) b is the least stable form of this compound

39.

What is correct about (b) & C)



(a) Both are achiral molecules

(b) Both contains chiral carbon

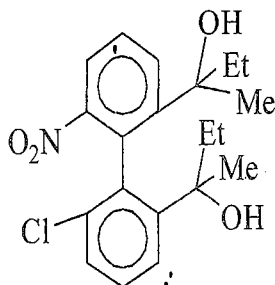
(c) Both are meso

(d) Both having same bond length.

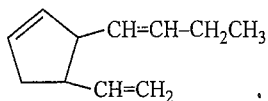
EXERCISE - III

Numerical & Subjective Answer Type

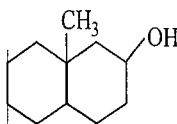
1. Number of stereoisomers in the given compound is



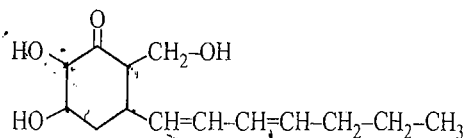
2. Stereoisomers possible for following compound is

3. Optical rotation produced by $\begin{array}{c} \text{CH}_3 \\ | \\ \text{H}-\text{C}-\text{Cl} \\ | \\ \text{H} \\ | \\ \text{CH}_3 \end{array}$ is 36° then that produced by $\begin{array}{c} \text{CH}_3 \\ | \\ \text{H}-\text{C}-\text{Cl} \\ | \\ \text{H} \\ | \\ \text{CH}_3 \end{array}$ is

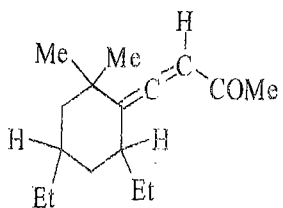
4. Sum of the total number of stereocentres and stereoisomers of the given compound will be



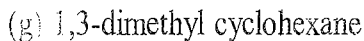
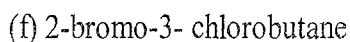
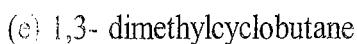
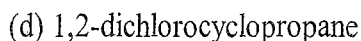
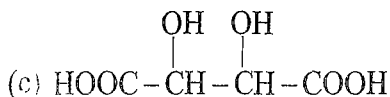
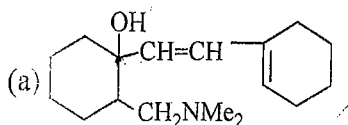
5. How many stereoisomer may have this natural occurring compound.



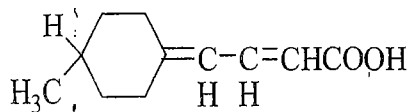
6. Dextrorotatory α -pinene has a specific rotation $[\alpha]_D^{20} = +51.3^\circ$. A sample of α -pinene containing both the enantiomers was found to have a specific rotation value $[\alpha]_D^{20} = +30.8^\circ$. The percentages of the (+) enantiomers present in the sample is
7. (+)-mandelic acid has a specific rotation of 158° . What would be the observed specific rotation of a mixture of 25% (-)-mandelic acid and 75% (+)-mandelic acid?
8. (+)-Tartaric acid has a specific rotation of $+12.0^\circ$. Calculate the specific rotation of a mixture of 68% (+)- tartaric acid and 32% (-)- tartaric acid.
9. An unknown compound weighing 4.2 gm is dissolved in enough carbon tetrachloride to make a total volume of 250 c.c. The observed rotation of this solution is $+357.75^\circ$ in a 25 cm cell using the sodium D line. But if 4.2 gm is dissolved in 125 cc we observed rotation is $+355.50^\circ$. Calculate specific rotation for this compound.
10. An optically pure compound X gave an $[\alpha]_D^{25} = +20.0^\circ$. A mixture of X and its enantiomer Y gave $[\alpha]_D^{25} = +10^\circ$. The Ratio of X to Y in the mixture is a : b. Then find the sum of a + b
11. The specific rotation of (S)-2-iodobutane is $+15.90^\circ$.
- (a) Predict the specific rotation of (R)-2-iodobutane.
- (b) Determine the percentage composition of a mixture of (R)- and (S)-2-iodobutane with a specific rotation of 7.95° .
12. Calculate total no. of stereoisomers of following compound?



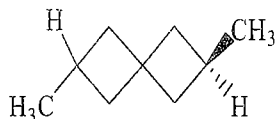
13. How many stereoisomers are possible for following compounds:



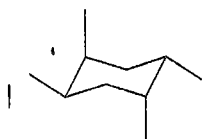
14. How many isomer are possible for the following molecule?



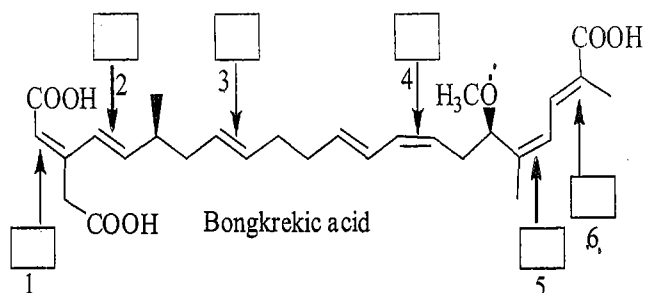
15. How many no. of atoms present are in the plane of paper of this compound



16. How many gauche intereaction are present in this compound.



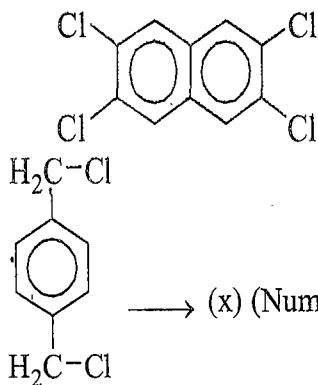
17. (a) Bongkreikic acid is a toxic compound produced by *Pseudomonas cocovenenans*, and isolated from a mold that rows on bongkrek, a fermented Indonesian coconut dish. (a) Label each double bond as E, Z or neither (N).



(b) How many total stereoisomers (including all types) are possible for bongkreikic acid?

(c) How many sites of unsaturation are present in bongkreikic acid?

18. Total number of plane of symmetry present in given compound is



19. (a) \longrightarrow (x) (Number of plane of symmetry)

(b) \longrightarrow (y) (Number of mesoisomer of 1, 2-dichlorocyclopentane)

Sum of (x + y = ?)

20. Fi

21. H

22. X

Fi

23. M

24. H

25. A

+C

(a

(b

(c

0.

(d

(e

(f

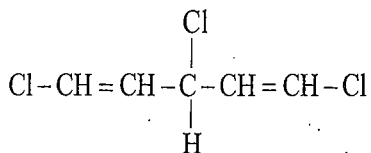
of

26. Tl

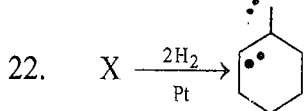
m

27. Tl

20. Find out the total number of stereoisomers of the given following compound.

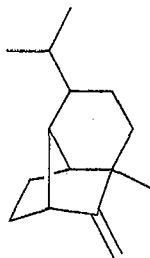


21. How many cyclopentane structures (excluding stereo isomer) are possible for C_7H_{14} .

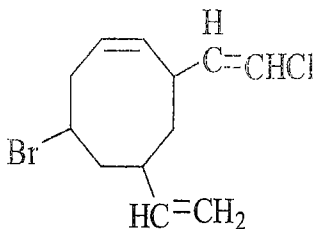


Find out total number of structures of X.

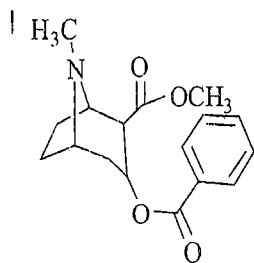
23. Minimum number of carbon atoms required for an alkane to show any kind of isomerism.
24. How many monochlorinated products of methyl cyclohexane are optically active.
25. A 0.1 M solution of an enantiomerically pure chiral compound, D has an observed rotation of $+0.20^\circ$ in a 1 dm sample container, the molecular mass of the compound is 150.
- What is the specific rotation of D ?
 - What is the observed rotation if this solution of D is diluted with an equal volume of solvent?
 - What is the observed rotation if this solution is mixed with an equal volume of a solution that is 0.1 M in L, the enantiomer of D?
 - What is the specific rotation of D after the dilution described in part (b) ?
 - What is the specific rotation of L, the enantiomer of D, after the dilution described in part (b)?
 - What is the observed rotation of 10 ml of a solution that contains 0.01 mole of D and 0.005 mole of L? (Assume a 1 dm path length)
26. The structural formula of sativene is shown below. How many stereogenic centers are there in this molecule?



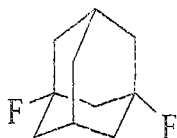
27. The number of all the possible stereoisomers formed by the given compound is:



28. The structural formula of cocaine is shown below. How many stereogenic carbon atoms are there in this molecule?



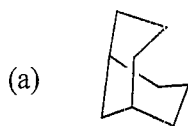
29. Number of POS and COS in the given compound is x and y. The value of x + y is



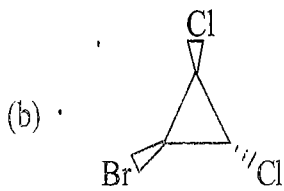
30. Match the Column (I) and (II).

Column I
Molecule

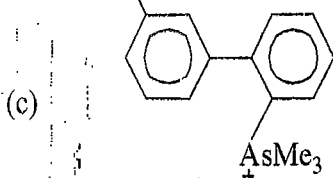
Column II
Property



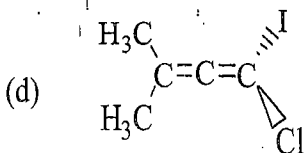
(p) Rotates plane polarized light



(q) Cannot rotate plane polarized light

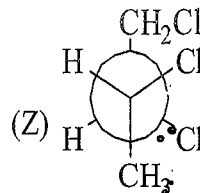
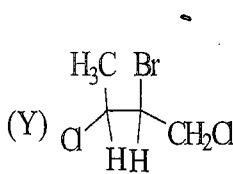
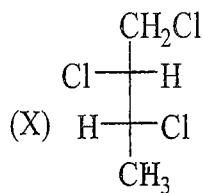
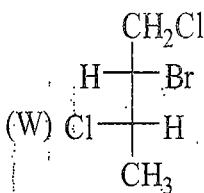


(r) Plane of symmetry



(s) Centre of symmetry

31. Consider the following statements regarding the given projection (True or False).



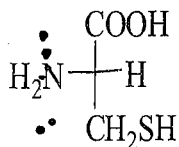
(a) W and Y are diastereomers.

(b) Z is the projection of X

(c) W, X, Y and Z are optically active

(d) Y and Z are isomer

e there in 32. The structure of one of the enantiomers of the amino acid cysteine is shown below.



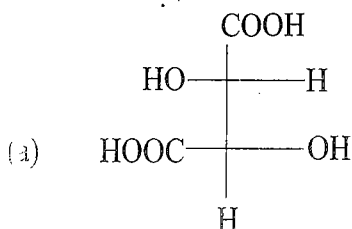
(Classify this structure as:

- (a) R or S (b) D or L

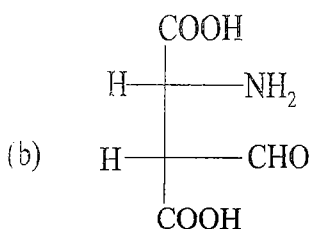
33. Match the column :

Column I

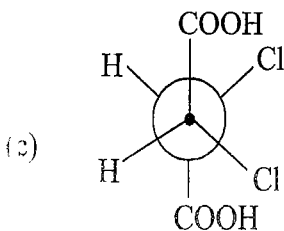
Column II



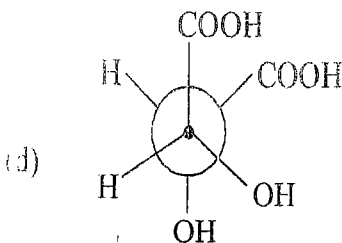
(P) Erythro



(Q) Threo



(R) Meso

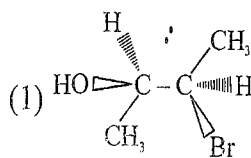
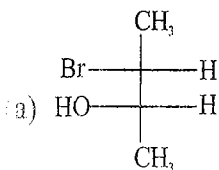


34. Match List-I, List-II & List-III :

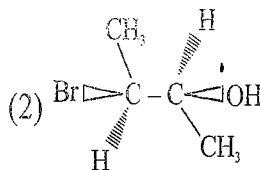
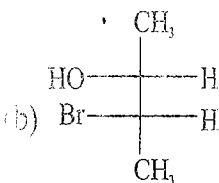
List-I

List-II

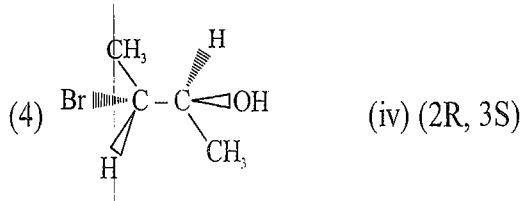
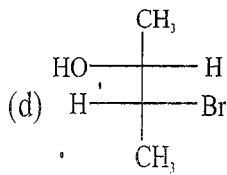
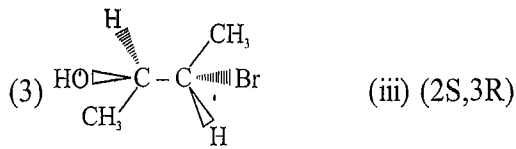
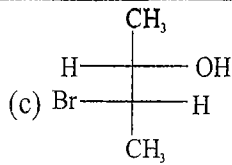
List-III



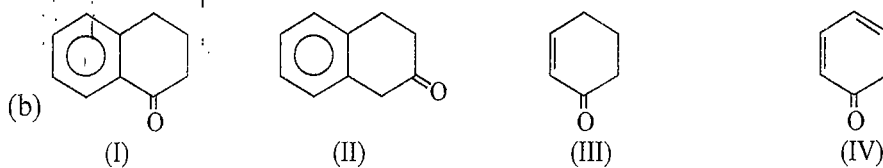
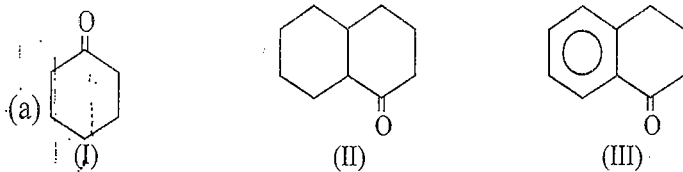
(i) (2R, 3R)



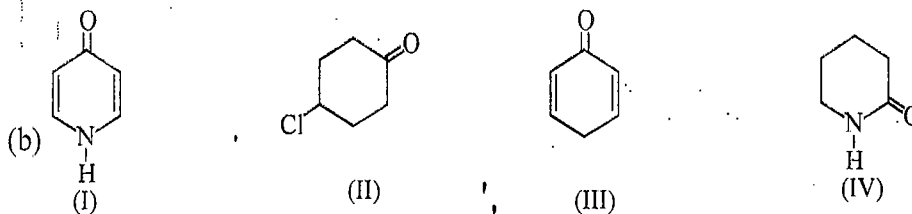
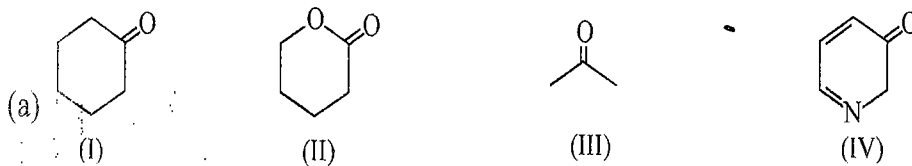
(ii) (2S, 3S)



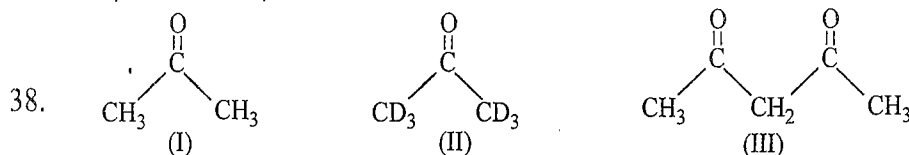
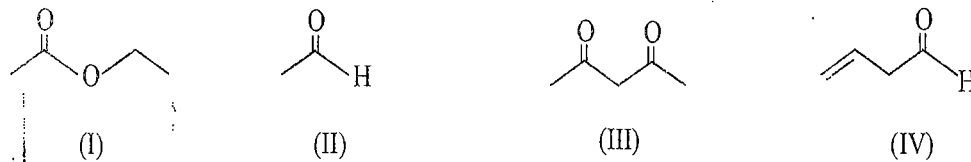
35. In each of the following sets of compounds write the decreasing order of % enol content.



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

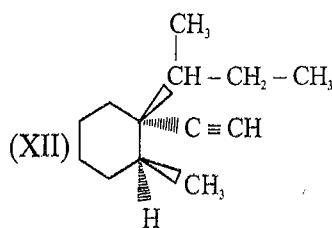
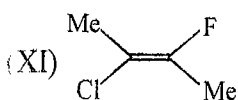
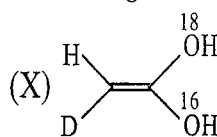
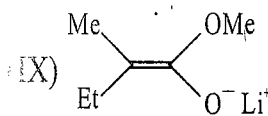
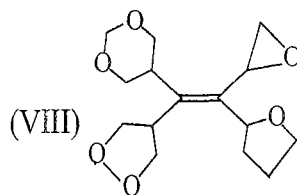
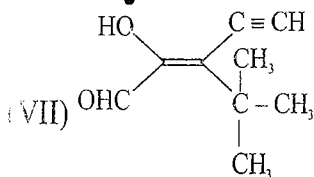
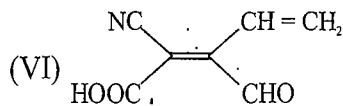
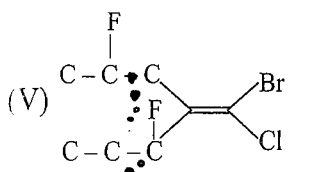
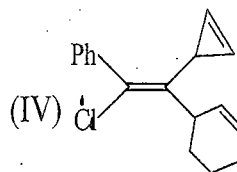
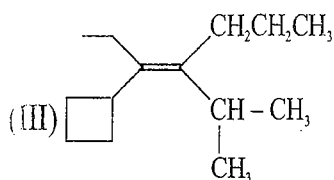
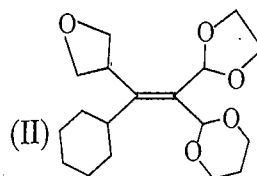
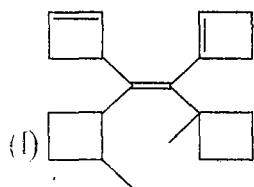


37. In each of the following sets of compounds write the decreasing order of % enol content.



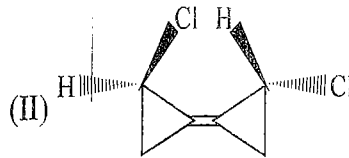
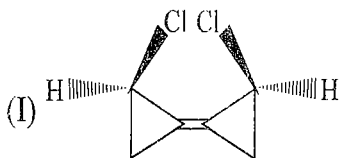
Among these give ease of enolization.

39. Assign E & Z configuration?

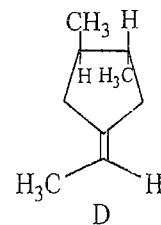
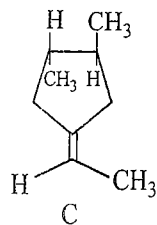
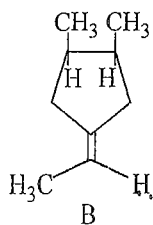
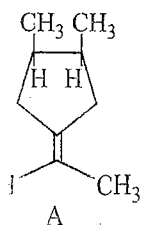


40. Draw the most stable conformer of N-methylpiperidine.

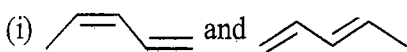
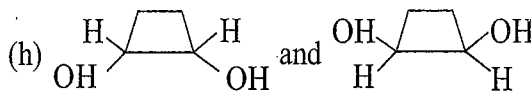
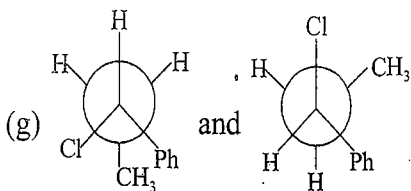
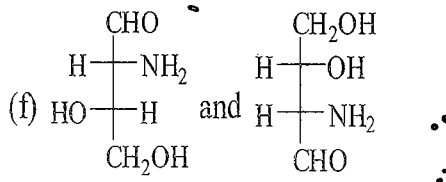
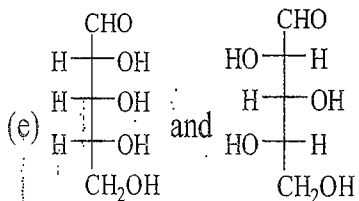
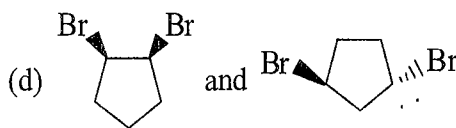
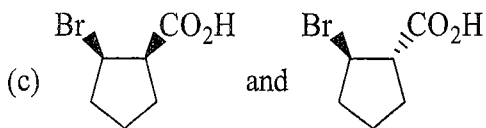
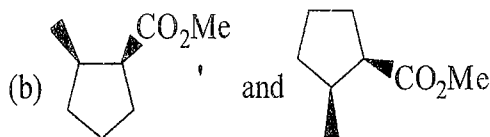
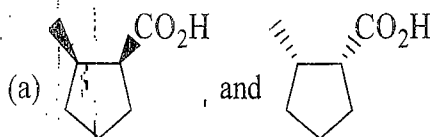
41. Discuss the optical activity of the following two compounds and also label them as polar and non-polar.



42. Select the pair of enantiomer and diastereomers out of the following:

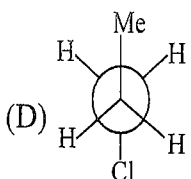
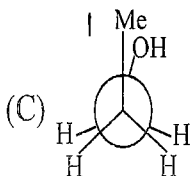
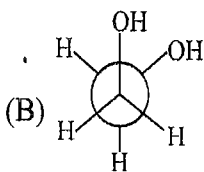
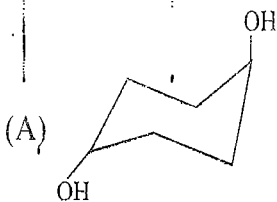


43. What are the relationships between the following pairs of isomers?



44. Match the column:

Column I



Column II

(P) Conformation of maximum torsional strain

(Q) Conformation with strong intramolecular hydrogen bond

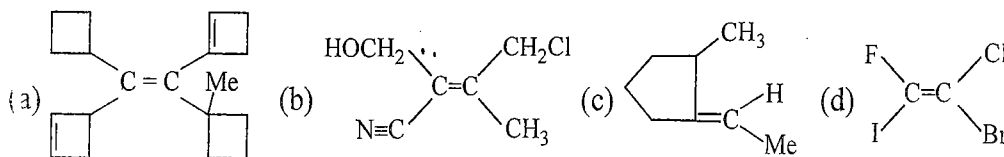
(R) Highest boiling point

(S) Conformation of minimum Vander Waal strain

45. (i) Draw the Newmann projection formula of the most stable conformation of 3-hydroxy propanal across C_2 and C_3 (in gas phase).
 (ii) This form is more stable than other forms because –
 A : minimum torsional strain
 B : intramolecular hydrogen bonding
 C: both

46. 1,2-dibromoethane has a zero dipole moment, whereas ethylene glycol, CH_2OHCH_2OH , has a measurable dipole moment. Explain.

47. Assign E & Z configuration to following compounds.

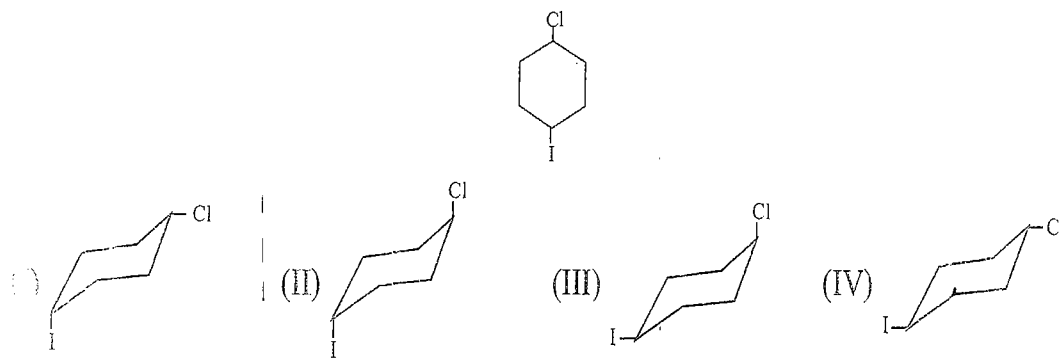


48. (a) Write Newman projections for the gauche and anti conformations of 1,2-dichloroethane ($ClCH_2CH_2Cl$)

(b) The measured dipole moment of $ClCH_2CH_2Cl$ is 1.12 D. Which among the following statements about 1,2-dichloroethane is/are false?

- (1) It may exist entirely in the anti conformation.
- (2) It may exist entirely in the gauche conformation.
- (3) It may exist as a mixture of anti and gauche conformations.

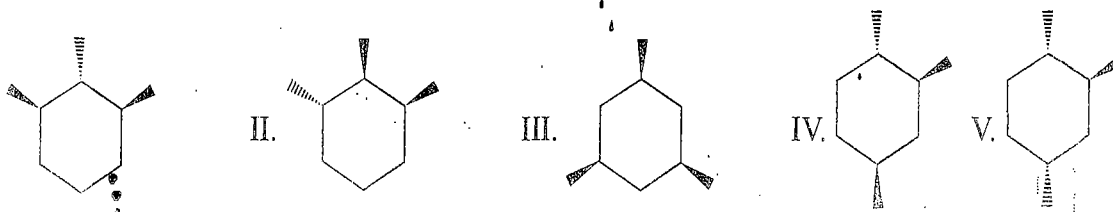
49. Write correct order of stability of different form of following compound X with suitable reason.



50. Which of the following compounds should have the larger energy barrier to rotation about the indicated bond?

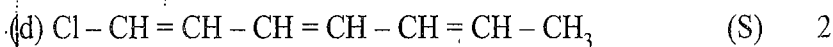
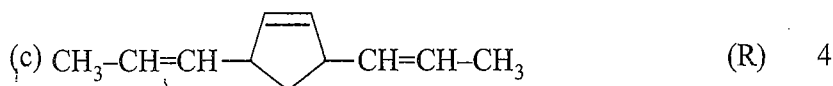
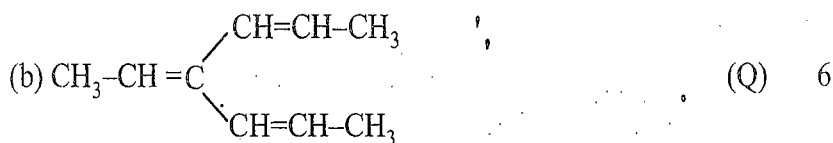
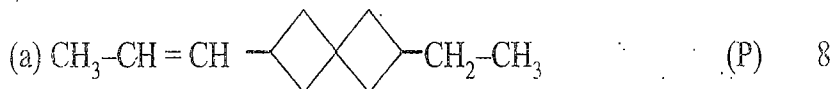
- (a) $Me_3C - CMe_3$ (b) $Me_3Si - SiMe_3$

51. Arrange the following in increasing order of their heat of combustion:

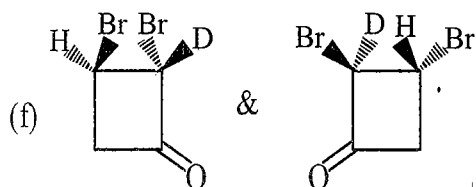
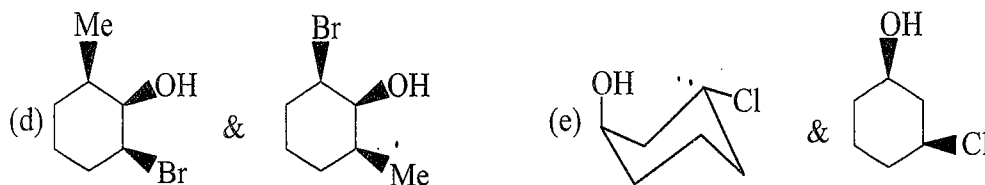
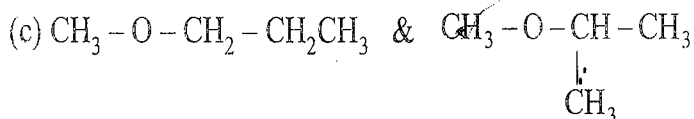
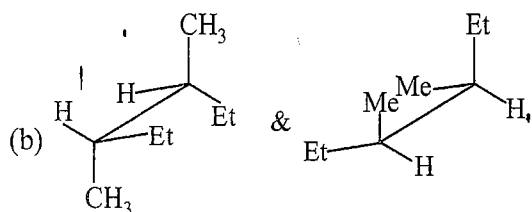
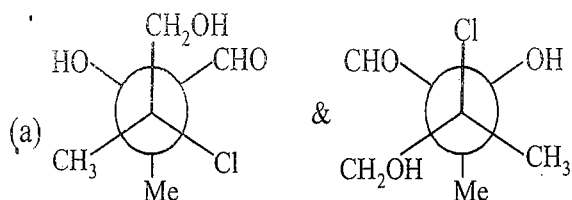


52. Match the following structural formulae with their possible geometrical isomers?

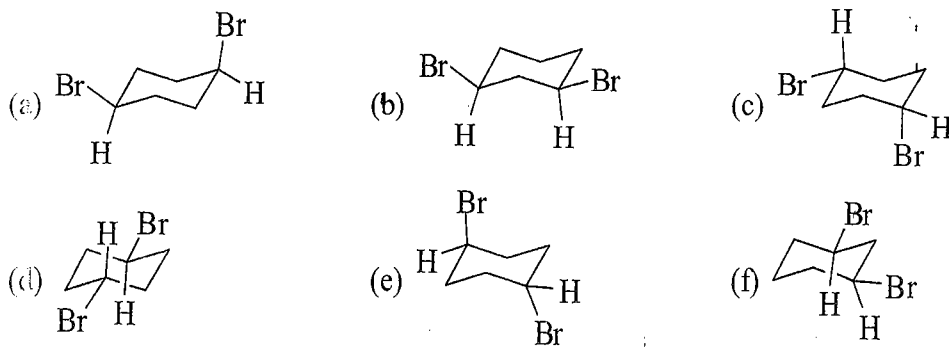
Column I (Structural formula)	Column II (Total geometrical isomers)
----------------------------------	--



53. Find relationship between following pairs.



54. Examine the following formulas and select those pairs that satisfy the following conditions:
Be sure to write two letters (and only two) in each answer box. In the second and fourth parts more than one answer is possible.



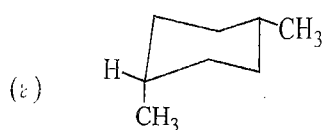
- A. Which are identical in all respects?
C. Which are conformational isomers?

- B. Which are configuration isomers?

55.

Column I

Column II



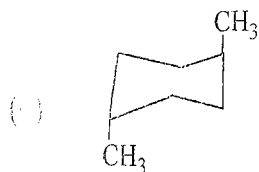
- (P) cis-form



- (Q) trans-form



- (R) K_{eq} is greater than one or equal to one when compound undergo flip.

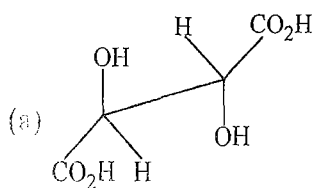


- (S) K_{eq} is less than one when compound undergo flip.

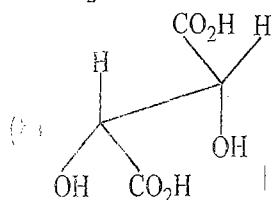
56. Match the column:

Column I

Column II

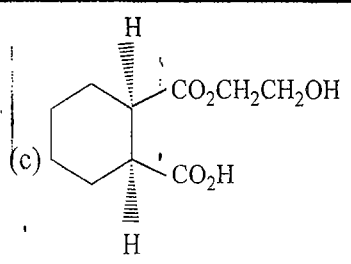


- (P) Chiral

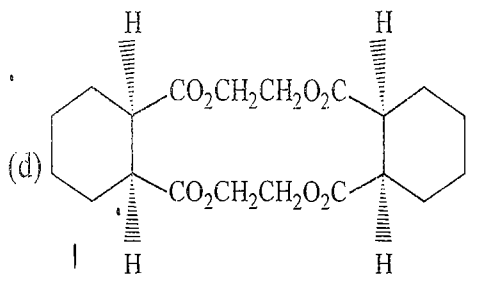


- (Q) A-chiral

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62. I
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63. S
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(R) Meso



(S) Compounds containing even number of chiral center

57. Match the column:

Column I

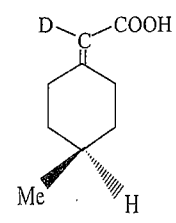
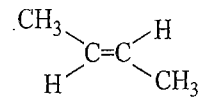
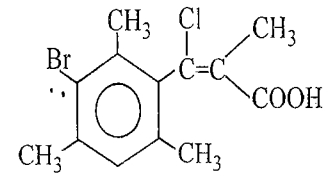
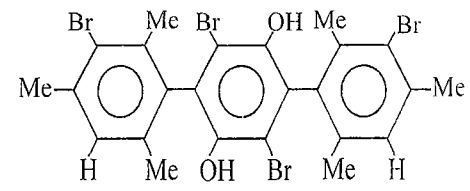
(A) Compound show geometrical isomerism (P)

(B) Compound shows optical isomerism (Q)

(C) Compound having plane of symmetry (R)

(D) Compound having centre of symmetry (S)

Column II



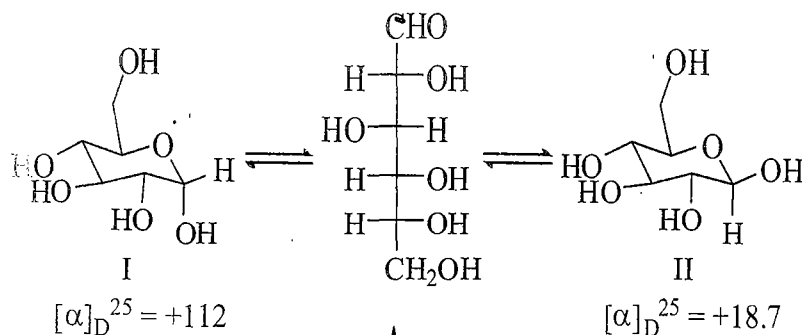
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58. What observed rotation is expected when a 1.5 M solution of (R)-2-butanol is mixed with an equal volume of a 0.75 M solution of racemic 2-butanol and the resulting solution is analysed in a sample container that is 1 dm long? The specific rotation of (R)-2-butanol is $-13.9^\circ \text{ml gm}^{-1} \text{dm}^{-1}$.

59. A pure sample of 2-chlorobutane shows rotation of PPL by 30° in standard conditions. When above sample is made impure by mixing its opposite form, so that the composition of the mixture becomes 87.5% d-form and 12.5% l-form, then what will be the observed rotation for the mixture.

60. When an optically active compound is placed in a 10 dm tube is present 20 gm in a 200 ml solution rotates the PPL by 30° . Calculate the angle of rotation & specific angle of rotation if above solution is diluted to 1 Litre.

61. Find out the approximate percentage composition of (+) MSG in a mixture containing (+) MSG and (-) MSG whose specific optical rotation is -20° .
62. If 33.8 g of (+) MSG was put in 338 ml solution and was mixed with 16.9 g of (-) MSG put in 169 ml solution and the final solution was passed through 400 mm tube. Find out observed rotation of the final solution.
63. Specific rotations of freshly prepared aqueous solutions of I and II are $+112$ and $+18.7$; respectively. On standing, the optical rotation of aqueous solution of I slowly decreases to give a final value of $+52.7$ due to equilibration with II. Under this state of equilibrium, what is the ratio II : I?

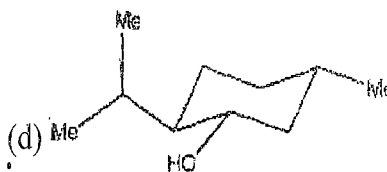
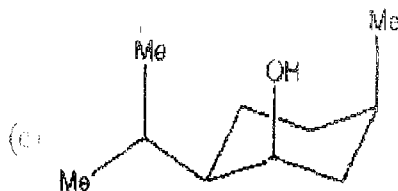
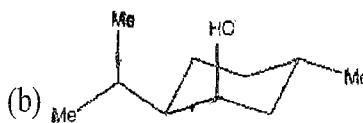
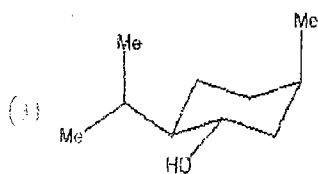
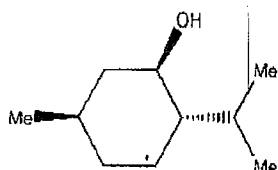


EXERCISE - IV

Previous Year Questions

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1. The most stable conformation of the molecule shown below is correctly represented by :

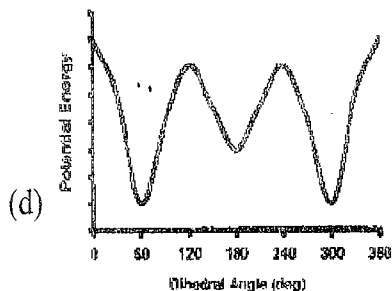
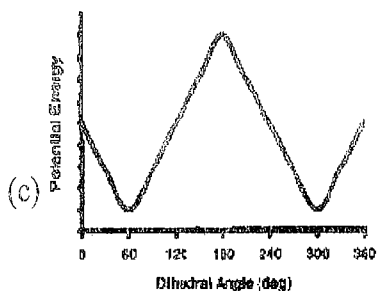
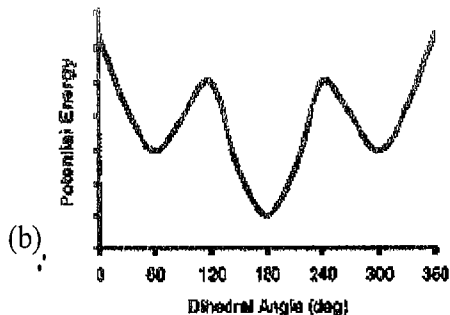
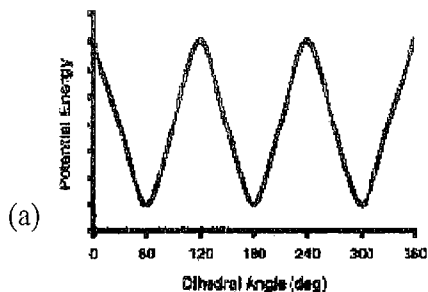


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2. The energy profile diagram that corresponds to 1, 2-dihydroxyethane for rotation around the C-C bond is



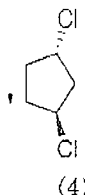
3. Which of the following is achiral?

- (a) alanine (b) glycine (c) proline (d) phenylalanine

4. Among the following, the correct statement concerning the optical activity is :

- (a) a molecule containing two or more chiral centres is always optically active
 (b) a molecule containing just one chiral centre, is always optically active
 (c) a molecule possessing alternating axis of symmetry is optically active
 (d) an optically active molecule should have atleast one chiral centre

5. Which of the following compounds is optically active ?



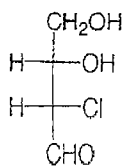
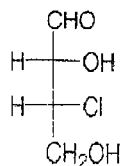
(a) 1

(b) 2

(c) 3

(d) 4

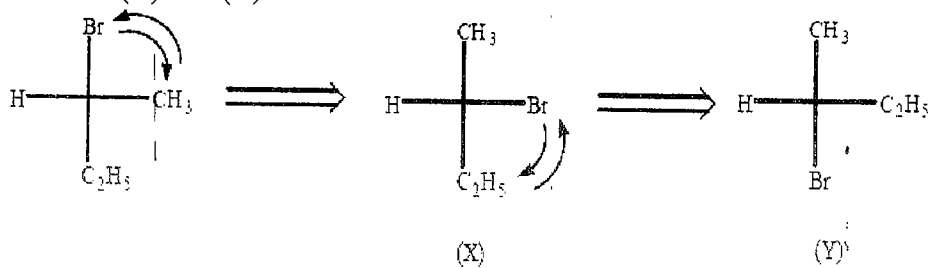
6.



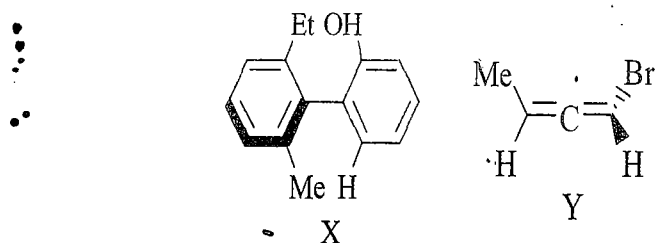
The given compounds 1 and 2 are

- (a) identical (b) diastereomeric (c) enantiomeric (d) constitutionally isomeric

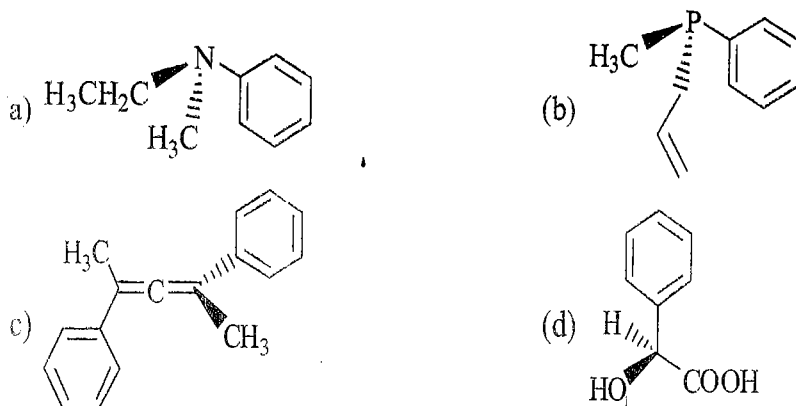
7. After the following interchanges of groups in the Fischer projection of 2-bromobutane, the configuration of (X) and (Y) will be :



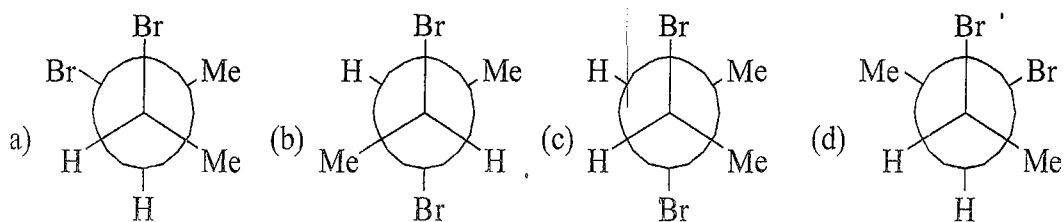
- (a) X = R; Y = S (b) X = R; Y = R (c) X = S; Y = R (d) X = S; Y = S
8. Reaction of enantiomerically pure acid with 1 chiral carbon and racemic alcohol with 1 chiral carbon gives an ester which is:
- (a) Meso (b) Optically active mixture
(c) Racemic mixture (d) Enantiomerically pure
9. The absolute configuration for compounds X and Y respectively are



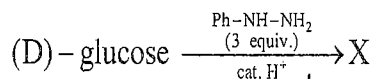
- (a) R, S (b) S, R (c) R, R (d) S, S
10. Among the following, the optically inactive compound is



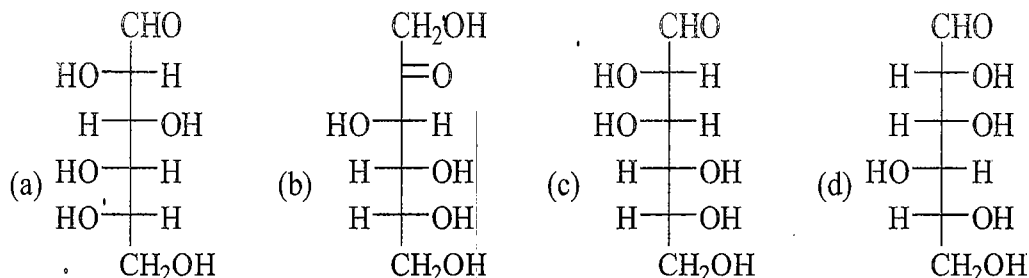
11. Among the following, the most stable conformation of meso-2,3-dibromobutane is



12. Consider the following reaction:



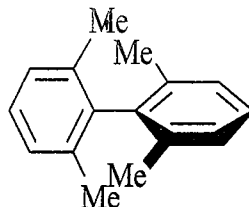
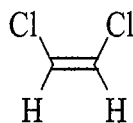
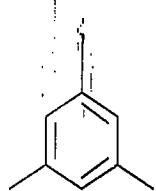
Among the following, the compound(s) whose osazone derivative(s) will have the same melting point as that of X is(are)



13. The number of all possible isomers for the molecular formula C_6H_{14} is _____.

14. Specific rotation of the (R)-enantiomer of a chiral compound is 48. The specific rotation of a sample of this compound which contains 25% of (S)-enantiomer is _____.

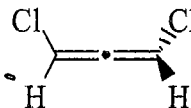
15. Among the following, the number of molecules that possess C_2 axis of symmetry is _____.



BF_3

CHCl_3

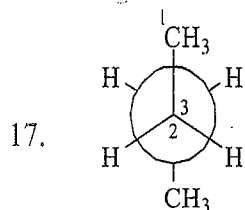
2,5-dimethylthiophene



11T-JEE Previous Year Questions

16. The compound which is not isomeric with diethyl ether is

- | | |
|---------------------------|-----------------|
| (a) n-propyl methyl ether | (b) butane-1-ol |
| (c) 2-methyl propane-2-ol | (d) butanone |



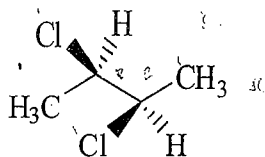
C_2 is rotated anti-clockwise 120° about $\text{C}_2\text{-C}_3$ bond. The resulting conformer is

- | | | | |
|------------------------|--------------|------------|---------------|
| (a) partially eclipsed | (b) eclipsed | (c) gauche | (d) staggered |
|------------------------|--------------|------------|---------------|

18. Only two isomeric monochloro-derivatives are possible for

- | | |
|--------------|---------------------------|
| (a) n-butane | (b) 2, 4-dimethyl pentane |
| (c) benzene | (d) 2-methyl propane |

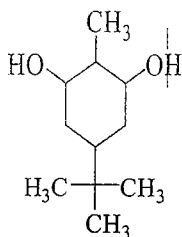
19. Which of the following compounds will show geometrical isomerism?
 (a) 2-butene (b) propene (c) 1-phenyl propene (d) 2-methyl-2-butene
20. The correct statement(s) about the compound given below is(are)



- (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

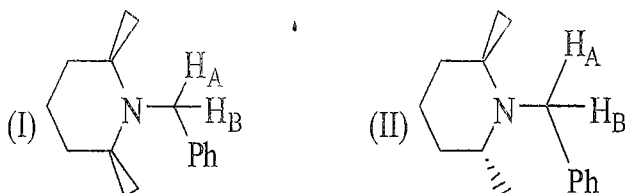
Gate Previous Year Questions

21. The optically active stereoisomers of the following compound is



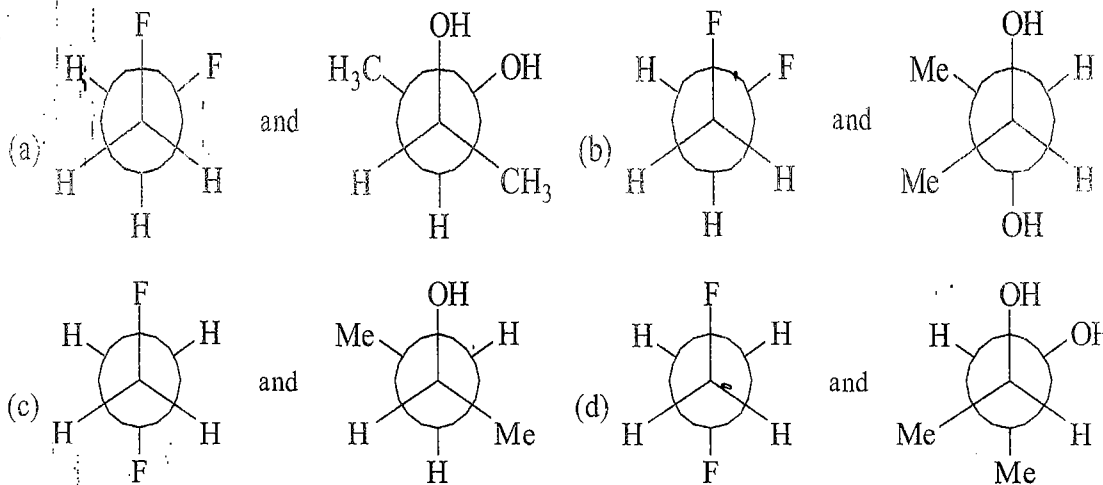
- (a)
- (b)
- (c)
- (d)

22. The rotational energy barrier between the most stable and the least stable conformations of 2,3-dimethylbutane along C_2-C_3 bond is
 [Given the energies ($K \text{ cal mol}^{-1}$)] for
 H/CH_3 eclipsing = 1.8 CH_3/CH_3 eclipsing = 2.9 CH_3/CH_3 gauche = 0.9
 (a) 4.6 (b) 4.5 (c) 4.7 (d) 4.8
23. The configuration of carbon atoms C3 and C4 in D-ribose, respectively are
 (a) R and S (b) S and R (c) R and R (d) S and S
24. The two benzylic hydrogen H_A and H_B in the compound I and II are :

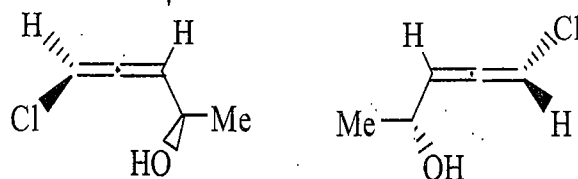


- (a) Diastereotopic in I and enantiotopic in II
 (b) Diastereotopic in II and enantiotopic in I
 (c) Diastereotopic in both I and II
 (d) Enantiotopic in both I and II

25. The most stable conformations of 1, 2 difluoroethane and dl-2, 3-butanediol are



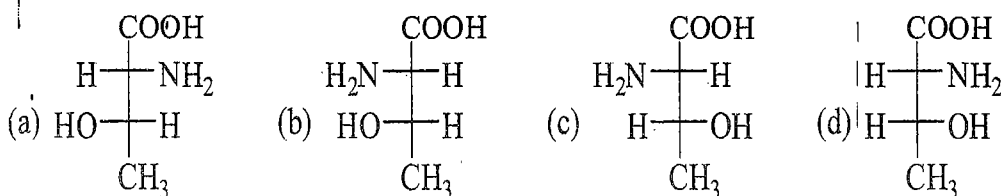
26. The correct relation between the following compounds is



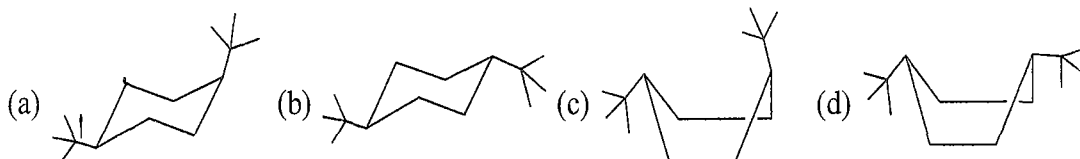
- (a) enantiomers (b) diastereomers
 (c) Homomers (identical) (d) Constitutional isomers
27. Bridge and hydrogen of the conformers of cis of cis-decalin is positioned as
 (a) a, a (b) a, e (c) e, e (d) pseudo-a, pseudo-e

NET Previous Year Questions

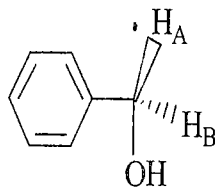
28. The structure of (2S, 3R) 2-amino-3-hydroxy butanoic acid is



29. The most stable conformation of cis-1, 4-di-t-butyl cyclohexane is :

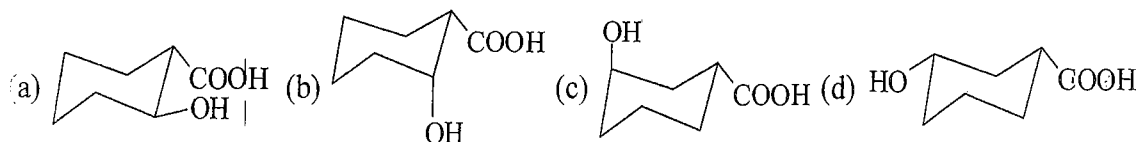


30. In the compound below, the hydrogen H_A & H_B are

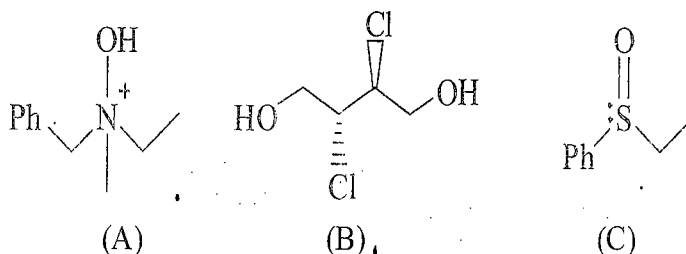


- (a) Homotopic (b) Enantiotopic (c) Diastereotopic (d) Isotopic

31. Identify the hydroxy cyclohexane carboxylic acid which, upon heating readily gives a bicyclic lactone

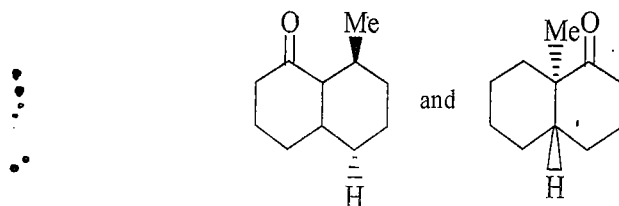


32. Among A – C, the compounds which are optically active



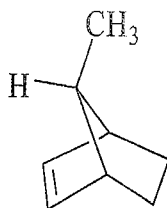
- (a) A, B and C (b) A and B only (c) A and C only (d) B and C only

33. The two compounds given below are



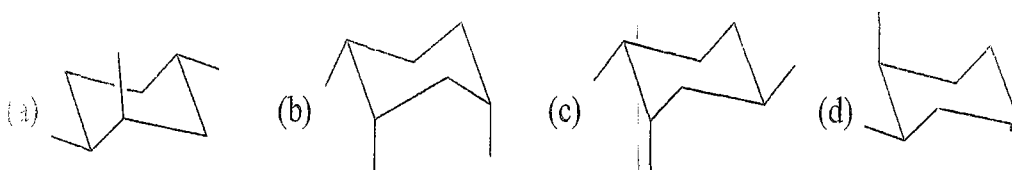
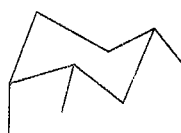
- (a) Enantiomers (b) Identical (c) Regioisomers (d) Diastereomers

34. The total possible stereoisomers of the given compound

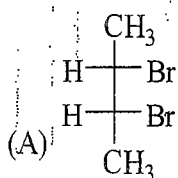


- (a) two (b) three (c) one (d) four

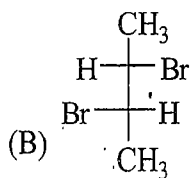
35. Which of the structure will be produced if a ring flip occur in the following compound in chair form



36. What can you predict about the stability of given structures.



Meso



(+)

(a) A is more stable than B

(c) Both A and B are equally stable

(b) B is more stable than A

(d) can't predict the stability

1. b

8. b

15. c

22. b

29. d

36. b

43. b

50. d

57. b

64. b

71. d

78. c

85. d

92. d

99. d

106. b

113. b

120. b

127. c

134. d

1. a,b,c

8. a,c,d

15. a,b,c

22. a,c

29. b,c

36. a,d

1. 8

8. +4.32

13. (a) 8

17. (a) 1

21. 4

25. (a) +

ANSWER KEY

EXERCISE I

1. b	2. c	3. b	4. b	5. a	6. a	7. b
8. b	9. b	10. b	11. b	12. a	13. a	14. c
15. c	16. c	17. a	18. d	19. c	20. c	21. a
22. b	23. b	24. c	25. a	26. b	27. a	28. c
29. d	30. a	31. c	32. b	33. c	34. d	35. b
36. b	37. b	38. b	39. b	40. b	41. a	42. c
43. b	44. c	45. d	46. c	47. c	48. c	49. d
50. d	51. d	52. a	53. a	54. a	55. c	56. c
57. b	58. b	59. d	60. a	61. a	62. a	63. a
64. b	65. c	66. d	67. e	68. c	69. d	70. b
71. d	72. b	73. c	74. b	75. c	76. b	77. a
78. c	79. b	80. d	81. c	82. a	83. b	84. c
85. d	86. d	87. b	88. c	89. c	90. a	91. b
92. d	93. d	94. d	95. a	96. c	97. b	98. d
99. d	100. d	101. a	102. c	103. d	104. a	105. c
106. b	107. a	108. c	109. c	110. c	111. a	112. d
113. b	114. a	115. a	116. d	117. c	118. d	119. a
120. b	121. b	122. d	123. c	124. c	125. b	126. d
127. c	128. a	129. a	130. b	131. c	132. b	133. d
134. d	135. b					

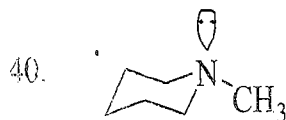
EXERCISE II

1. a,b,c	2. a,b,c,d	3. b,d	4. a,b,c,d	5. b,c	6. a,b,c	7. a,b,c
8. a,c,d	9. b,c	10. b,c	11. a,b,c	12. a,c	13. a,b	14. a,c,d
15. a,b,c	16. a,c	17. b,c,d	18. b,c	19. a,b,d	20. a,c	21. c,d
22. a,c	23. c,d	24. a,b	25. b,c,d	26. a,d	27. a,c,d	28. a,b
29. b,c	30. a,b	31. a,c	32. b,c	33. b,c,d	34. a,b,c	35. b,c
36. a,d	37. b,c,d	38. a,b,c	39. a,b,c,d			

EXERCISE III

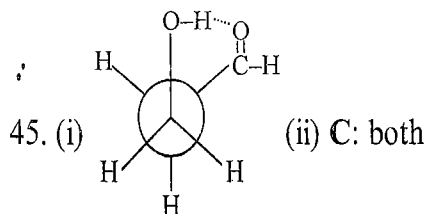
1. 8	2. 8	3. 0	4. 11	5. 64	6. 80	7. +79
8. +4.32	9. -5.357	10. 4	11. (a) -15.90 (b) 75% S and 25% R			12. 8
13. (a) 8 (b) 1 (c) 3 (d) 3 (e) 2 (f) 4 (g) 3			14. 4	15. 7	16. 6	
17. (a) 1-Z; 2-E; 3-E; 4-Z; 5-Z; 6-E (b) 2 ⁹ (c) 10			18. 3	19. 4		20. 4
21. 4	22. 7	23. 4	24. 8			
25. (a) +13. (b) 0.10 (c) 0 (d) unchanged (e) changed (f) 1				26. 5		27. 32

28. 4 29. I 30. a-q,r; b-p; c-q; d-q,r 31. a-True; b-True; c-True; d-False
 32. a - R, b - L 33. A-R; B-P; C-Q, D-R 34. (a-4-iii); (b-3-iv); (c-2-ii); (d-1-i)
 35. (a) $3 > 1 > 2$ (b) $4 > 2 > 1 > 3$ 36. (a) $4 > 1 > 3 > 2$; (b) $3 > 1 > 4 > 2$
 37. $3 > 4 > 2 > 1$ 38. $3 > 1 > 2$
 39. Z-I, II, III, VI, VII; E-IV, V, VIII, IX, X, XI, XII



41. Compound I is optically inactive since it contains a plane of symmetry. Compound II is enantiomeric since it does not contain a plane of symmetry, hence chiral. Also compound I is polar while II is non polar
 42. Diastereomer (A,C)(A,D);(B,C)(B,D) ; Enantiomer \longrightarrow (A,B) (C,D)
 43. (a) Enantiomers (b) Enantiomers (c) Geometrical isomers & Diastereomers (d) Positional (e) Optical (diastereomers) (f) Diastereomers (g) Enantiomers (h) Identical (i) Geometrical isomers (diastereomers)

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



46. Due to anti conformation but in glycol due to hydrogen bonding gauche is name

47. (a) E; (b) Z; (c) E; (d) Z 48. (b) (1) F, (2) F, (3) T

49. $IV > III > I > II$

50. $a > b$ (a) size of C is smaller than Si so b.l. is larger is (b)

51. $III < IV < I < V < II$ 52. (A) S, (B) R (C) Q (D) P

53. (a) Diastereoisomers (b) Identical (c) Positional isomer (d) Enantiomer (e) Geometrical isomer (f) Identical

54. A-(a & c) (b & f); B-(a & d) or (c & d), (a & e) (c & d); C - (d & e)

55. (A) — P,R; (B) — Q,S; (C) — P,R; (D) — Q,R

56. (A) Q,R,S; (B) P,S; (C) P,S; (D) Q,R,S 57. (A) P, Q, R; (B) P, Q, S; (C) R; (D) R

58. -0.77° 59. $+22.5^\circ$

60. 6° & 30° 61. 91.6%

62. $+3.2^\circ$ 63. 1.75

EXERCISE IV

- | | | | | | | |
|-------|-------|-------|-------|-----------|---------|--------|
| 1. d | 2. d | 3. b | 4. b | 5. d | 6. d | 7. c |
| 8. b | 9. b | 10. a | 11. b | 12. a,b,c | 13. 5 | 14. 24 |
| 15. 7 | 16. d | 17. c | 18. d | 19. a,c | 20. a,d | 21. b |
| 22. c | 23. c | 24. b | 25. a | 26. c | 27. b | 28. c |
| 29. d | 30. b | 31. b | 32. c | 33. c | 34. b | 35. b |
| 36. a | | | | | | |