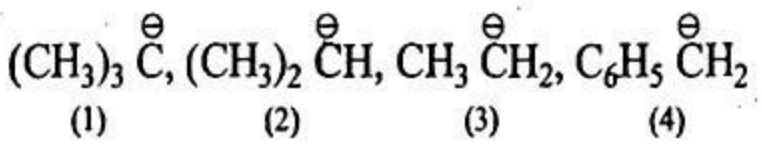
OBJECTIVE QUESTIONSH

1. The correct order of decreasing stability of the carbanions is



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

2. Chlorine in vinyl chloride is not very reactive because:
   (a) sp^2 hybridized carbon has shorter bond length than sp^3 hybridized carbon
   (b) C – Cl bond develops partial double bond character
   (c) of resonance
   (d) all are correct

3. The correct order of stability of the following carbocations is:
   (a) $CH_3CH_2\overset{+}{C}H_2 > CH_2{=}CH{-}\overset{+}{C}H_2 > CH_2{=}CH\overset{+}{C}HCH_3 > CH_2{=}CH\overset{+}{C}(CH_3)_2$
   (b) $CH_2{=}CH\overset{+}{C}H_2 > CH_3CH_2\overset{+}{C}H_2 > CH_2CH\overset{+}{C}(CH_3)_2 > CH_2{=}CH\overset{+}{C}HCH_3$
   (c) $CH_2{=}CH\overset{+}{C}(CH_3)_2 > CH_2{=}CH\overset{+}{C}HCH_3 > CH_2{=}CH\overset{+}{C}H_2 < CH_3CH_2\overset{+}{C}H_2$
   (d) $CH_2{=}CH{-}\overset{+}{C}HCH_3 > CH_2{=}CH_2\overset{+}{C}(CH_3)_2 > CH_3CH_2{-}\overset{+}{C}H_2 > CH_2{=}CH\overset{+}{C}H_2$

4. The electromeric effect involves:
   (a) a slight displacement of σ-electrons
   (b) a slight displacement of π-electrons
   (c) the complete transfer of σ-electrons
   (d) the complete transfer of π-electrons

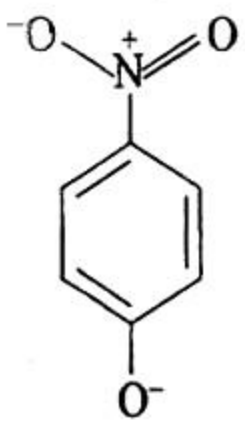
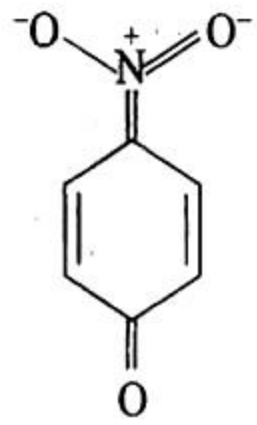
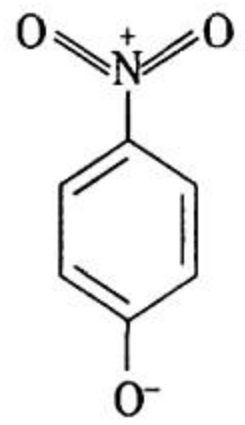
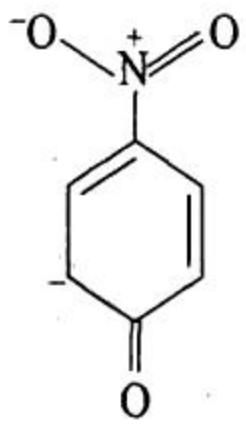
5. In which of the following pairs of carbocations, the first carbocation is more stable than the second?
   (a) $CH_2{=}CH{-}\overset{+}{C}H_2$ and $CH_2{=}CH{-}CH_2{-}\overset{+}{C}H_2$
   (b) $CH_3{-}NH{-}\overset{+}{C}H_2$ and $\overset{+}{C}H_2{-}OH$
   (c) $CH_3{-}O{-}\overset{+}{C}H_2{-}CH_2$ and $CH_3{-}O{-}\overset{+}{C}H_2$
   (d) $CH_3{-}\overset{+}{C}H{-}CH_2CH_2CH_3$ and $CH_3CH_2{-}\overset{+}{C}H{-}CH_2CH_3$

6. Which of the following is the strongest nucleophile?
   (a) $HC{\equiv}C^-$ (b) $H_2C{=}CH^-$ (c) $CH_3{-}CH_2^-$ (d) NH_2^-

7. The false statements among the following are:
   (i) A primary carbocation is less stable than a tertiary carbocation
   (ii) A secondary propyl carbocation is less stable than allyl carbocation
   (iii) A tertiary free radical is more stable than a primary free radical
   (iv) A isopropyl carbanion is more stable than ethyl carbanion
   (a) (i) and (ii) (b) (ii) and (iii) (c) (i) and (iv) (d) (ii) and (iv)

8. The arrangement of $(CH_3)_3C–$, $(CH_2)_2CH–$, $CH_3CH_2–$ when attached to benzene or an unsaturated group in increasing order of inductive effect is:
   (a) $(CH_3)_3C- < (CH_3)_2CH- < CH_3CH_2-$
   (b) $CH_3CH_2- < (CH_3)_2CH- < (CH_3)_3C-$
   (c) $(CH_3)_2CH- < (CH_3)_3C- < CH_3CH_2-$
   (d) $(CH_3)_3C- < CH_3CH_2- < (CH_3)_2CH-$

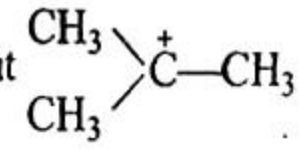
9. The most unlikely representation of resonance structures of *p*-nitrophenoxide ion is:

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

10. Point out the incorrect statement about resonance?
   (a) Resonance structure should have equal energy
   (b) In resonance structure, the constituent atoms must be in the same position
   (c) In resonance structures, there should not be same number of electron pairs
   (d) Resonance structures should differ only in the location of electrons around the constituent atoms

11. The most stable free radical among the following is:
   (a) $C_6H_5CH_2\dot{C}CH_2$
   (b) $C_6H_5\dot{C}HCH_3$
   (c) $CH_3\dot{C}H_2$
   (d) $CH_3\dot{C}HCH_3$

12. Homolytic fission of C–C bond in ethane gives an intermediate in which carbon is:
   (a) sp^3-hybridized
   (b) sp^2-hybridized
   (c) *sp*-hybridized
   (d) sp^2d-hybridized

13. Among the following, the true property about  is:
   (a) non-planar
   (b) C^+ is sp^2-hybridized
   (c) electrophile can attack C^+
   (d) does not undergo hydrolysis

14. Consider the following carbocations:
   I. $C_6H_5\overset{+}{C}H_2$
   II. $C_6H_5CH_2\overset{+}{C}H_2$
   III. $C_6H_5\overset{+}{C}HCH_3$
   IV. $C_6H_5\overset{+}{C}(CH_3)_2$

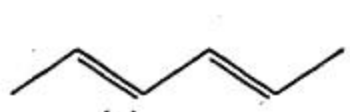
   The correct sequence for the stability of these is:
   (a) II < I < III < IV
   (b) II < III < I < IV
   (c) III < I < II < IV
   (d) IV < III < I < II

15. A less stable carbonium ion rearranges to a more stable carbonium ion. During this rearrangement, the migrating atom or group leaves as a:
    (a) free radical (b) carbene
    (c) positively charged ion (d) negatively charged ion.

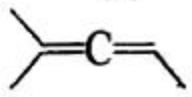
16. Which behaves as a nucleophile as well as an electrophile?
    (a) CH_3NH_2 (b) CH_3Cl (c) CH_3CN (d) CH_3OH.

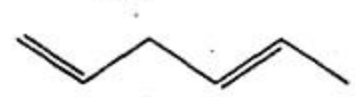
17. Alkyl groups are *o*, *p*-directing because of:
    (a) inductive effect (b) electromeric effect
    (c) hyperconjugation effect (d) all the three

18. The correct stability order of following species is:


(x)

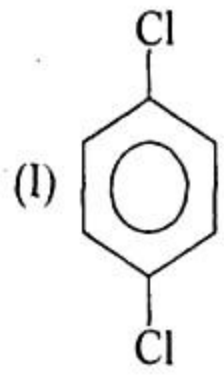

(y)

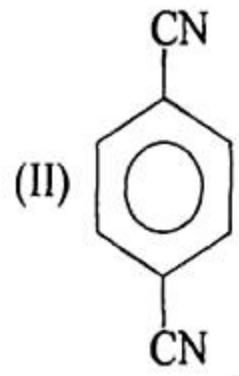

(z)

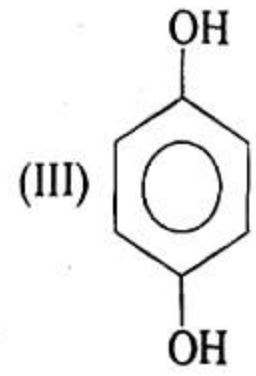

(w)

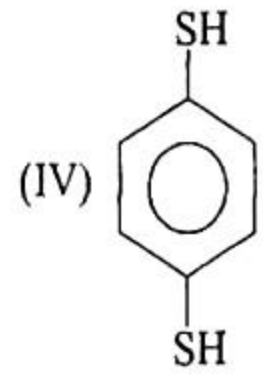
    (a) x > y > w > z (b) y > x > w > z
    (c) x > w > z > y (d) z > x > y > w

19. For which of the following molecules $\mu \neq 0$?


(I)

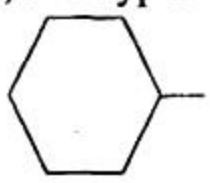
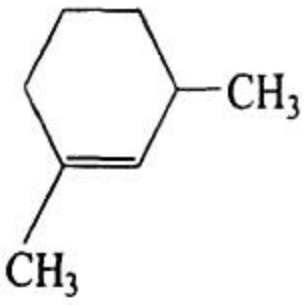
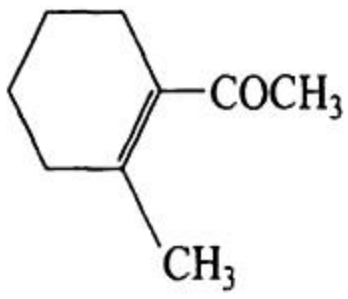

(II)


(III)

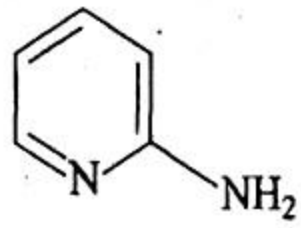

(IV)

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

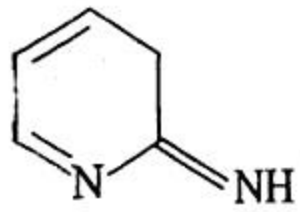
20. Which of the following is unacceptable resonating structure of buta-1,2,3-triene?
    (a) $\overset{\ominus}{\ddot{C}}H_2—C\equiv C—\overset{\oplus}{C}H_2$ (b) $CH_2—C=C=CH_2$
    (c) $\overset{\oplus}{C}H_2—C\equiv C—\overset{\ominus}{\ddot{C}}H_2$ (d) $\dot{C}H_2—C\equiv C—\dot{C}H_2$

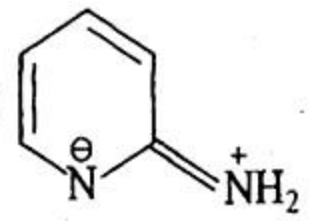
21. In which of the following molecules all the effects namely inductive, mesomeric, and hyperconjugation operate?
    (a) 
    (b) 
    (c) 
    (d) 

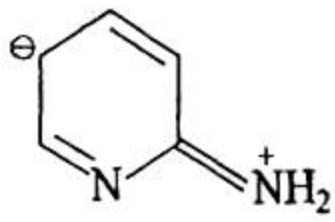
22. The proper tautomeric structure for 2-aminopyridine (X) is :

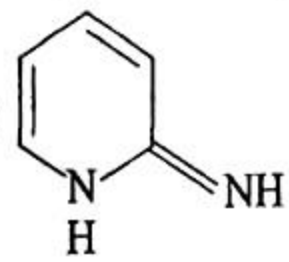


(X)

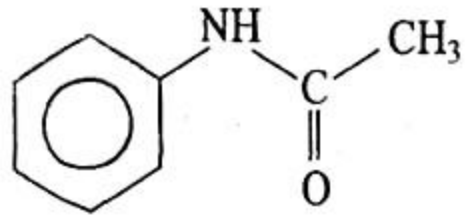
(a) 

(b) 

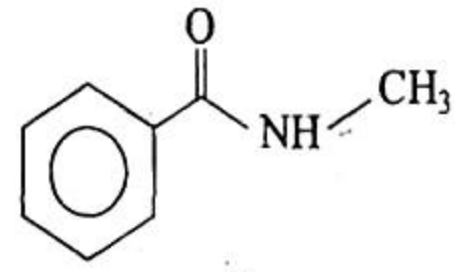
(c) 

(d) 

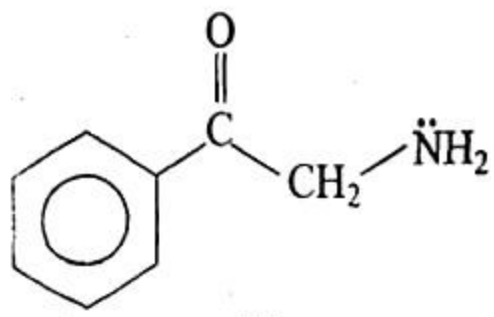
23. The correct basic strength order is:



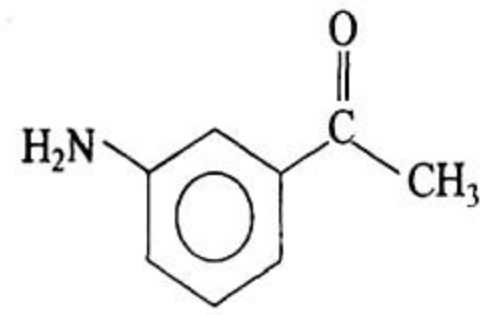
I



II



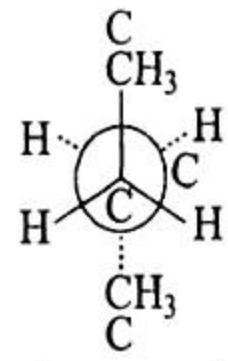
III



IV

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

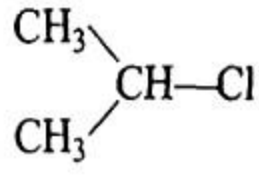
24. In the given conformation, if C_2 is rotated about $C_2 - C_3$ bond anticlockwise by an angle of 120°, then the conformation obtained is:

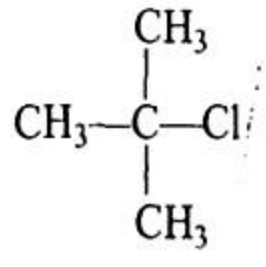


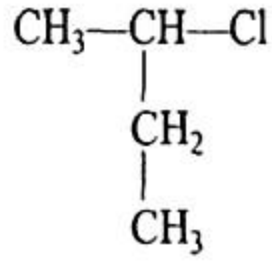
(a) fully eclipsed conformation
(b) partially eclipsed conformation
(c) gauche conformation
(d) staggered conformation

25. SN^1 reaction is faster in:

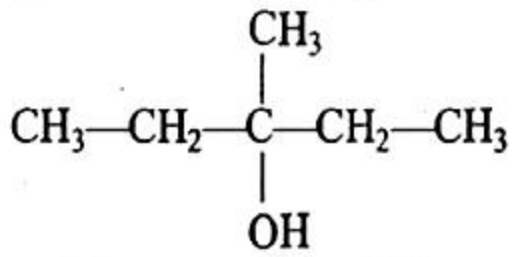
(a) CH_3CH_2Cl

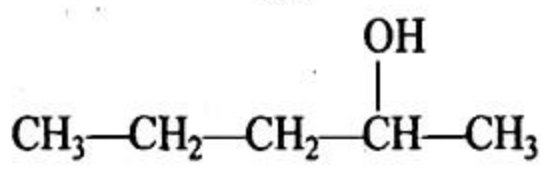
(b) 

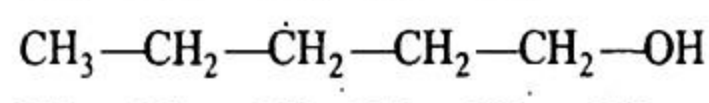
(c) 

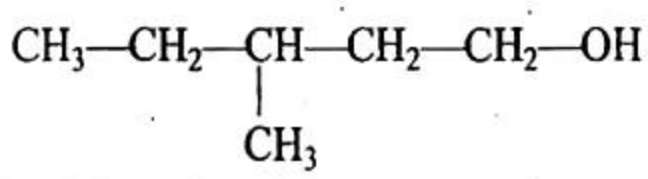
(d) 

26. Among the following compounds which can be dehydrated very easily?

(a) 

(b) 

(c) 

(d) 

27. Which of the following statements is not characteristic of free radical chain reaction?

(a) It gives major product derived from most stable free radical

(b) It is usually sensitive to change in solvent polarity

(c) It proceeds in three main steps such as initiation, propagation, and termination

(d) It may be initiated by UV light

28. Most stable carbanion is:

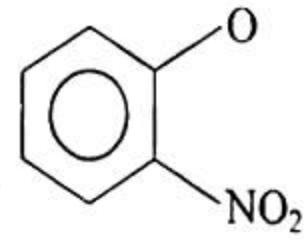
(a) CH_3^- (b) $CH_3CH_2^-$ (c)  (d) 

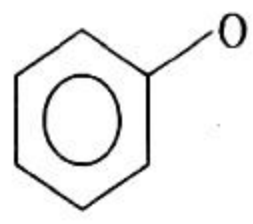
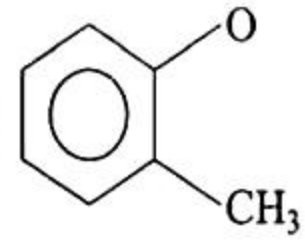
29. Among the following the dissociation constant is highest for:

(a) C_6H_5OH (b) $C_6H_5CH_2OH$

(c) $CH_3C{\equiv}CH$ (d) $CH_3NH_3^+Cl^-$

30. Which one of the following compounds is most acidic?

(a) $Cl—CH_2—CH_2—OH$ (b) 

(c)  (d) 

31. Which one is electrophilic addition?

(a) $CH_3—CH_3 + Cl_2 \rightarrow C_2H_5Cl + HCl$

(b) $CH_3CH{=}O + HCN \rightarrow (CH_3)_2C(OH)CN$

(c) $Br_2 \rightarrow Br^\bullet + Br^\bullet$

(d) $CH_2{=}CH_2 + Br_2 \rightarrow CH_2BrCH_2Br$

32. A compound has three chiral carbon atoms. Find the number of possible optical isomers it can have:

(a) 3 (b) 2 (c) 8 (d) 4

33. How many chiral isomers can be drawn from 2-bromo,3-chloro butane?

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

34. Number of isomers of C_4H_{10} is:

(a) 2 (b) 3

(c) 4 (d) Isomerism not exist

35. The number of possible isomers for compound $C_2H_3Cl_2Br$ is:

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

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

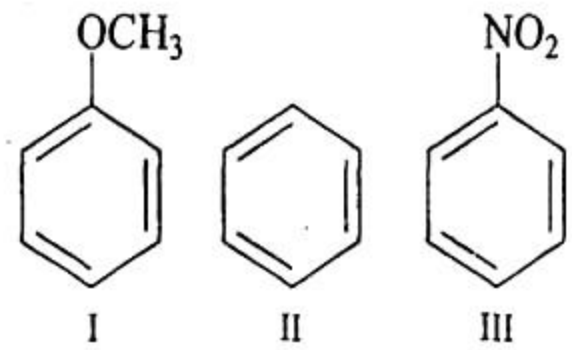
(a) optical rotation and is derived from D-glucose

(b) pH in organic solvent

(c) optical rotation and is derived from D-(+) glyceraldehyde

(d) optical rotation only when substituted by deuterium

37. Among the following compounds (I–III), the correct order of reaction with electrophilic reagent is:



I II III

(a) II > III > I (b) III < I < II (c) I > II > III (d) I = II > III

38. Carbocation which is most stable is:

(a) $CH_3CH_2^+$ (b) CH_3^+

(c) $C_6H_5CH_2^+$ (d) $CH_3CH_2CH_2^+$

39. Which behaves both as a nucleophile and electrophile?

(a) CH_3NH_2 (b) CH_3Cl (c) CH_3CN (d) CH_3OH

40. The number of optical isomers of an organic compound having *n* asymmetric carbon atoms will be:

(a) 2^{n+1} (b) n^2 (c) 2^n (d) 2^{n-1}

41. With a change in hybridization of the carbon bearing the charge, the stability of a carbanion increase in the order:

(a) $sp < sp^2 < sp^3$ (b) $sp < sp^3 < sp^2$

(c) $sp^3 < sp^2 < sp$ (d) $sp^2 < sp < sp^3$

42. The C–C bond length of the following molecules is in the order:

(a) $C_2H_6 > C_2H_4 > C_6H_6 > C_2H_2$

(b) $C_2H_2 < C_2H_4 < C_6H_6 < C_2H_6$

(c) $C_2H_6 > C_2H_2 > C_6H_6 > C_2H_4$

(d) $C_2H_4 > C_2H_6 > C_2H_2 > C_6H_6$

43. In the reaction $CH_3CHO + HCN \rightarrow CH_3CH(OH)CN$, a chiral center is produced. This product would be:

(a) levorotatory (b) meso compound

(c) dextrorotatory (d) racemic mixture

44. Cyclic hydrocarbon molecule *A* has all the carbon and hydrogen in a single plane. All the carbon–carbon bonds are of same length less than 1.54 Å, but more than 1.34 Å. The C—C bond angle will be:

(a) 109°28′ (b) 100° (c) 180° (d) 120°

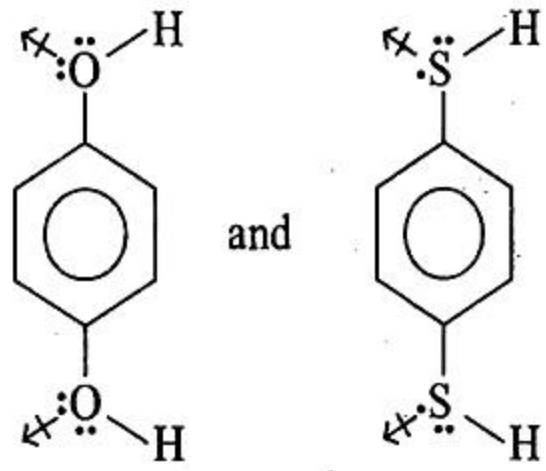
45. How many structural isomers are possible for a compound with molecular formula C_3H_7Cl?

(a) 2 (b) 5 (c) 7 (d) 9

HINTS AND SOLUTIONS

1. (b)
2. (d)
3. (c)
4. (d)
5. (a)
6. (c)
7. (d)
8. (a)
9. (c)
10. (a)
11. (b)
12. (b)
13. (b)
14. (a)
15. (d)
16. (c)
17. (c)
18. (c) x is a conjugated diene system, w is an isolated system.
z is a cumulated diene system, y is antiaromatic system.
Hence, stability order is x > w > z > y.

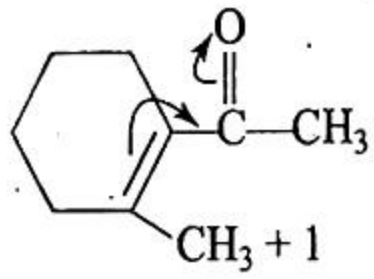
19. (d) The net dipole moment is not zero.



20. (d) $CH_2=C=C=CH_2 \longleftrightarrow \overset{\oplus}{C}H_2-C\equiv C-\overset{\oplus}{C}H_2 \longleftrightarrow \overset{\oplus}{C}H_2-C\equiv C-\overset{\oplus}{C}H_2$

$\dot{C}H_2-C\equiv C-\dot{C}H_2$ is unacceptable, as it has two unpaired electrons.

21. (c)



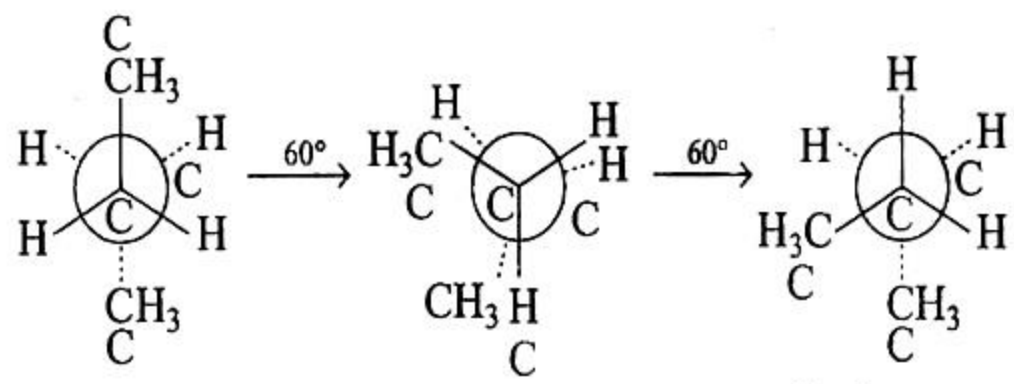
Has all effect inductive, measomeric, and hyperconjugation.

Hyperconjugation

22. (a)

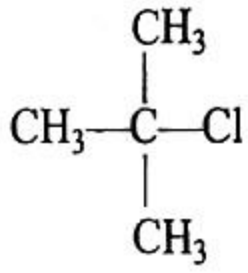
23. (d) The basicity order will be inversely proportional to resonance stability of lone pair.

24. (c)



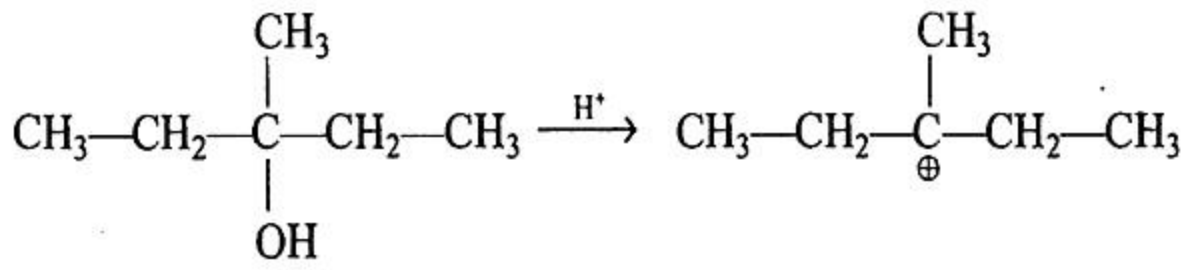
Gauche

25. (c) SN^1 mechanism proceeds through carbocation intermediate.



provides stable carbocation intermediate because it has a tertiary carbon.

26. (a)

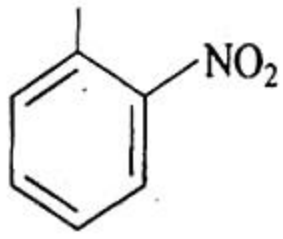


The more stable carbocation is generated. Thus more easily it will be dehydrated.

27. (b) This option is not characteristics of free radical chain reaction.

28. (c) Due to NO_2 group in benzene ring,  is most stable carbanion.

29. (d) Dissociation of proton from $CH_3—\overset{+}{N}H_3Cl^-$ is very difficult due to –I effect of Cl^- and N^+, while in C_6H_5OH, due to resonance stabilization of phenoxide ion, proton gets eliminated easily. Similarly, due to H-bonding in $C_6H_5CH_2OH$, it can be eliminated, and $CH_3C{\equiv}CH$ show acidic character by triple bond by which proton can be dissociated.

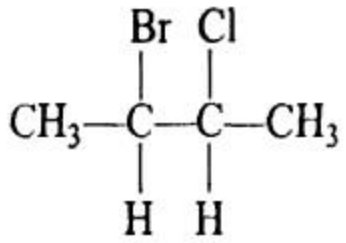
30. (b) 

Electron-withdrawing group increases acidic character due to –I and –R effects of NO_2. Hence, orthonitrophenol is most acidic.

31. (d) Halogenation on alkene occurs by electrophilic addition.

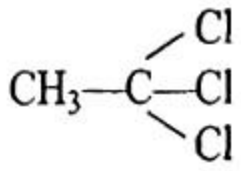
32. (c) The number of possible optical isomers = 2^n.
(where n is the number of chiral C atoms) = $2^3 = 8$

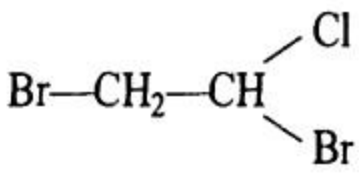
33. (c) 2-bromo,3-chloro butane has 2 chiral carbon atoms. Hence, it has $2^2 = 4$ optical isomers.

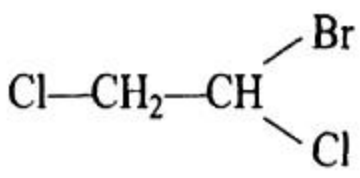


34. (a) $CH_3—CH_2—CH_2—CH_3$, $CH_3—\underset{\underset{CH_3}{|}}{CH}—CH_3$
n-Butane
Isobutane

35. (b) For $C_2H_3Cl_2Br$, three isomers are possible.

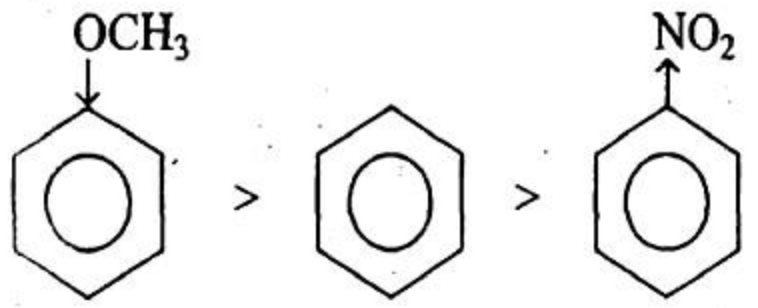

1-Bromo-1,1-dichloroethane


1-Bromo-2,2-di-chloroethane


1-Bromo-1, 2-dichloroethane

36. (c) D-(+)-tartaric acid has positive optical rotation and is derived from D-(+)-glyceraldehyde.

37. (c) I > II > III



Methoxy group is electron releasing; thus it increases electron density of benzene nucleus. However, $-NO_2$ decreases electron density of benzene.

38. (c) Due to resonance, benzyl carbonium ion is most stable.

39. (c) CH_3CN behaves both as a nucleophile and electrophile.

40. (c) 2^n, where n is the number of asymmetric carbon atoms.

41. (c) Stability of carbanions increases with increase in the s-character of hybrid orbitals of carbon bearing charge. Hence the correct order is $sp^3 < sp^2 < sp$.

42. (b) $\underset{1.20\text{Å}}{C_2H_2} < \underset{1.34\text{Å}}{C_2H_4} < \underset{1.39\text{Å}}{C_6H_6} < \underset{1.54\text{Å}}{C_2H_6}$

43. (d) $CH_3CHO + HCN \rightarrow CH_3—\underset{\displaystyle OH}{\overset{\displaystyle \cdot}{\underset{|}{C}}}H—CN$

Both d and l forms are obtained. Hence, product will be a racemic mixture.

44. (d) Molecule A is benzene, because in benzene bond length is between single and double bond.

45. (a) Two isomers $CH_3—\underset{\displaystyle Cl}{\underset{|}{C}}H—CH_3$ and

$CH_3—CH_2—CH_2Cl$ are possible for C_3H_7Cl.