

Classification and Nomenclature of Organic Compounds

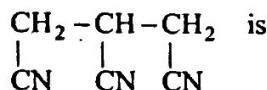
1. The C – H bond distance is longest in :

- (a) C_2H_6
- (b) C_2H_2
- (c) $C_2H_2Br_2$
- (d) C_2H_4

2. The IUPAC name of $CH_3 - C \equiv C - CH(CH_3)_2$ is :

- (a) 4-methyl-2-pentyne
- (b) 4, 4-dimethyl-2-butyne
- (c) methyl isopropyl acetylene
- (d) 2-methyl-4-pentyne

3. The IUPAC name of the compound :



- (a) 1, 2, 3-trinitropropane
- (b) 1, 2, 3-tricyanopropane
- (c) 3-cyanopentane-1, 5-dinitrile
- (d) 1, 2, 3-pantanetrinitrile

4. The IUPAC name of the compound

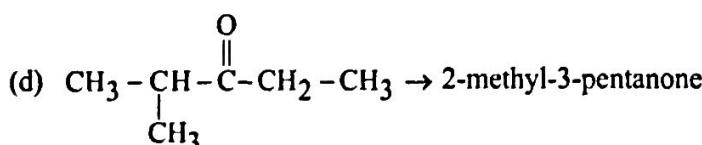
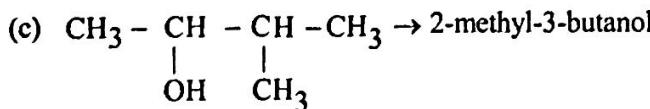
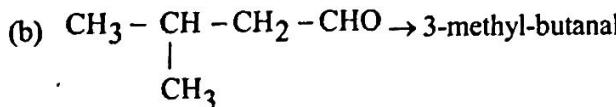
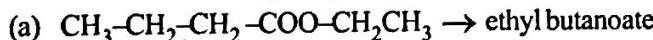


- (a) 3-ethoxy-1-methoxypropane
- (b) 1-ethoxy-3-methoxypropane
- (c) 2, 5-dioxyhexane
- (d) ethoxypropane oxymethane

5. The first organic compound, synthesized in the laboratory, was

- (a) alcohol
- (b) acetic acid
- (c) urea
- (d) None of these

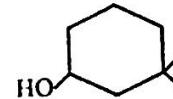
6. Which of the following compounds has wrong IUPAC name?



7. The IUPAC name of $CH_3COCH(CH_3)_2$ is

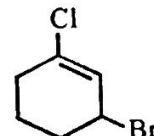
- (a) 2-methyl-3-butanone
- (b) 4-methylisopropyl ketone
- (c) 3-methyl-2-butanone
- (d) Isopropylmethyl ketone

8. The IUPAC name of the compound is



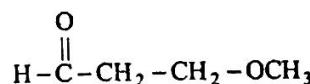
- (a) 3, 3-dimethyl - 1- cyclohexanol
- (b) 1, 1-dimethyl-3-hydroxy cyclohexane
- (c) 3, 3-dimethyl-1-hydroxy cyclohexane
- (d) 1, 1-dimethyl-3-cyclohexanol

9. The IUPAC name of the compound shown below is :



- (a) 3-bromo-1-chlorocyclohexene
- (b) 1-bromo-3-chlorocyclohexene
- (c) 2-bromo-6-chlorocyclohex-1-ene
- (d) 6-bromo-2-chlorocyclohexene

10. IUPAC name of the compound is :

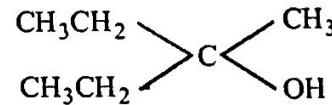


- (a) 2 – methoxypropanal
- (b) methoxypropanal
- (c) 3 – methoxypropanal
- (d) 2 – formyl methoxyethane

11. IUPAC name of $CH_3 - CH = CH - C \equiv CH$ is :

- (a) pent-2-ene-4-yne
- (b) pent-1-yne-3-ene
- (c) pent-3-ene-1-yne
- (d) None of these

12. Name of the following compound is :



- (a) 2-ethylbutan-2-ol
- (b) 1-ethyl-1-methylpropan-1-ol
- (c) 3-methyl pentan-3-ol
- (d) diethylethanol

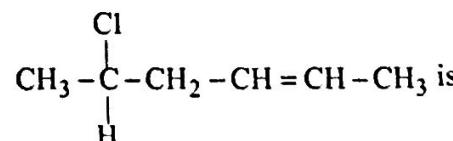
13. The IUPAC name of the compound $CH_3CONHBr$ is :

- (a) 1-bromoacetamide
- (b) ethanoylbromide
- (c) N-bromoethanamide
- (d) None of the above

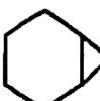
14. The number of secondary hydrogens in 2, 2-dimethylbutane is :

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

15. The IUPAC name for



- (a) 5-chlorohex-2-ene
- (b) 2-chlorohex-5-ene
- (c) 1-chloro-1-methylpent-3-ene
- (d) 5-chloro-5-methylpent-2-ene

16. Which of the following compounds contains 1° , 2° , 3° as well as 4° carbon atoms?
 (a) Neopentane (b) 2-methyl pentane
 (c) 2,3-dimethyl butane (d) 2,2,3-trimethyl pentane
17. The correct name for the following hydrocarbon is
- 
- (a) Tricyclo [4.1.0] heptane (b) Bicyclo [5.2.1] heptane
 (c) Bicyclo [4.1.0] heptane (d) Bicyclo [4.1.0] heptane
18. The general formula $C_nH_{2n}O_2$ could be for open chain
 (a) carboxylic acids (b) diols
 (c) dialdehydes (d) diketones
19. The compound name trichloroethene is –
 (a) westron (b) perclene
 (c) westrosol (d) orlon

Isomerism in Organic Compounds

20. Which of the following is an optically active compound ?
 (a) 1-Butanol (b) 1-Propanol
 (c) 2-Chlorobutane (d) 4-Hydroxyheptane
21. Which one of the following can exhibit cis-trans isomerism ?
 (a) $CH_3 - CHCl - COOH$ (b) $H - C \equiv C - Cl$
 (c) $ClCH = CHCl$ (d) $ClCH_2 - CH_2Cl$
22. An important chemical method to resolve a racemic mixture makes use of the formation of
 (a) a meso compound (b) enantiomers
 (c) diasteromers (d) racemates
23. The process of separation of a racemic modification into d and l -enantiomers is called
 (a) Resolution (b) Dehydration
 (c) Revolution (d) Dehydrohalogenation
24. Tautomerism will be exhibited by
 (a) $(CH_3)_2NH$ (b) $(CH_3)_3CNO$
 (c) R_3CNO_2 (d) RCH_2NO_2

25. A compound of molecular formula of C_7H_{16} shows optical isomerism, compound will be
 (a) 2, 3-Dimethylpentane (b) 2,2-Dimethylpentane
 (c) 2,4 - Dimethylpentane (d) None of these

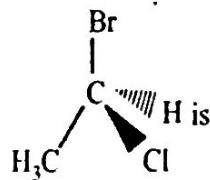
26. $\bar{C}H_2 - C - CH_3$ and $\bar{C}H_2 = C - CH_3$ are
- 

- (a) resonating structures (b) tautomers
 (c) geometrical isomers (d) optical isomers

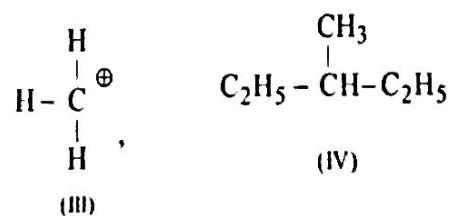
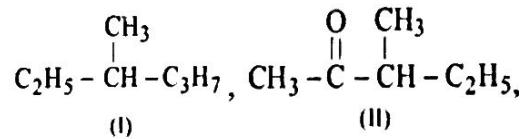
27. Geometrical isomers differ in
 (a) position of functional group
 (b) position of atoms
 (c) spatial arrangement of atoms
 (d) length of carbon chain

28. Which of the following pairs of compounds are enantiomers?
- (a)
- | | |
|---|---|
| CH_3 | CH_3 |
| $HO - \begin{array}{c} \\ H \end{array} - H$ | $HO - \begin{array}{c} \\ H \end{array} - H$ |
| $H - \begin{array}{c} \\ OH \end{array} - CH_3$ | $H - \begin{array}{c} \\ HO \end{array} - CH_3$ |
- and
- | | |
|---|---|
| CH_3 | CH_3 |
| $HO - \begin{array}{c} \\ H \end{array} - H$ | $HO - \begin{array}{c} \\ H \end{array} - H$ |
| $H - \begin{array}{c} \\ CH_3 \end{array} - OH$ | $H - \begin{array}{c} \\ HO \end{array} - CH_3$ |
- (b)
- | | |
|---|---|
| CH_3 | CH_3 |
| $H - \begin{array}{c} \\ OH \end{array} - H$ | $HO - \begin{array}{c} \\ H \end{array} - H$ |
| $HO - \begin{array}{c} \\ CH_3 \end{array} - H$ | $H - \begin{array}{c} \\ CH_3 \end{array} - OH$ |
- and
- | | |
|---|---|
| CH_3 | CH_3 |
| $H - \begin{array}{c} \\ OH \end{array} - H$ | $HO - \begin{array}{c} \\ H \end{array} - H$ |
| $HO - \begin{array}{c} \\ CH_3 \end{array} - H$ | $H - \begin{array}{c} \\ CH_3 \end{array} - OH$ |
- (c)
- | | |
|---|---|
| CH_3 | CH_3 |
| $H - \begin{array}{c} \\ OH \end{array} - H$ | $HO - \begin{array}{c} \\ H \end{array} - H$ |
| $HO - \begin{array}{c} \\ CH_3 \end{array} - H$ | $H - \begin{array}{c} \\ CH_3 \end{array} - OH$ |
- and
- | | |
|---|---|
| CH_3 | CH_3 |
| $H - \begin{array}{c} \\ OH \end{array} - H$ | $HO - \begin{array}{c} \\ H \end{array} - H$ |
| $HO - \begin{array}{c} \\ CH_3 \end{array} - H$ | $H - \begin{array}{c} \\ CH_3 \end{array} - OH$ |
- (d)
- | | |
|---|---|
| CH_3 | CH_3 |
| $H - \begin{array}{c} \\ OH \end{array} - H$ | $HO - \begin{array}{c} \\ H \end{array} - H$ |
| $HO - \begin{array}{c} \\ CH_3 \end{array} - H$ | $H - \begin{array}{c} \\ CH_3 \end{array} - OH$ |

29. Number of chiral carbons in β -D-(+)-glucose is
 (a) five (b) six (c) three (d) four
30. The chirality of the compound



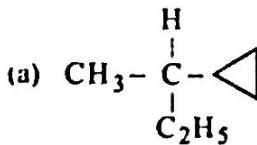
- (a) R (b) S (c) E (d) Z
31. Which one of the following pairs represents stereoisomerism?
 (a) Structural isomerism and Geometrical isomerism
 (b) Optical isomerism and Geometrical isomerism
 (c) Chain isomerism and Rotational isomerism.
 (d) Linkage isomerism and Geometrical isomerism
32. Among the following four structures I to IV,



- it is true that
 (a) only I and II are chiral compounds
 (b) only III is a chiral compound
 (c) only II and IV are chiral compounds
 (d) all four are chiral compounds

33. Which of the following will have a mesoisomer also?
 (a) 2, 3- Dichloropentane (b) 2, 3-Dichlorobutane
 (c) 2-Chlorobutane (d) 2-Hydroxypropanoic acid

Amongst the following compounds, the optically active
amine having lowest molecular mass is



- (b) $\text{CH}_3 - \text{CH}_2 - \overset{\text{CH}_3}{\underset{|}{\text{CH}}} - \text{CH}_3$

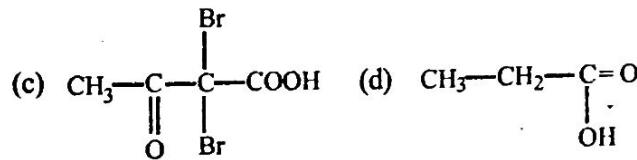
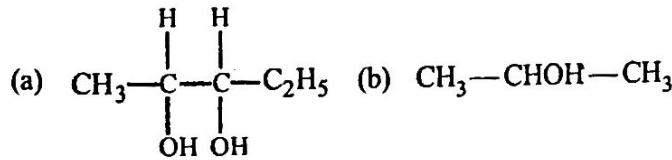
(c) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$

(d) $\text{CH}_3 - \text{CH}_2 - \text{C} \equiv \text{CH}$

35. Which of the following compounds exhibits stereoisomerism?

- (a) 2-Methyl-1-butene
 - (b) 3-Methyl-1-butyne
 - (c) 3-Methylbutanoic acid
 - (d) 2-Methylbutanoic acid

36. Which of the following is optically active ?



37. Total number of structural isomers possible for C_3H_6 are :

38. An aromatic compound of formula C_7H_7Cl has in all isomers :

39. Which of the following compounds is optically active?

- (a) $\text{CH}_3\text{CHClCOOH}$ (b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
 (c) $(\text{CH}_3)_2\text{CHOH}$ (d) $(\text{CH}_3)_3\text{CCl}$

40. How many optically active stereoisomers are possible for lactic acid?

41. Optical isomerism is shown by :

42. Geometrical isomerism is possible in : -

- (a) $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{CH}_3$
 - (b) $\text{CH}_3\text{CH} = \text{CHCH}_3$
 - (c) $\text{CH}_3\text{CH} = \text{CH}_2$
 - (d) $\text{ClH}_2\text{C} - \text{CH}_2\text{Cl}$

43. How many acyclic structural isomers are possible for the compound with molecular formula $C_3H_3Cl_3$?
 (a) 3 (b) 2 (c) 5 (d) 6

44. Geometrical isomerism can be shown by:
 (a) $>C=N-$ (b) $-N=N-$
 (c) $>C=C<$ (d) All of these

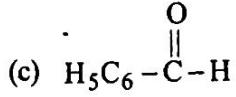
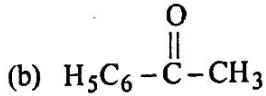
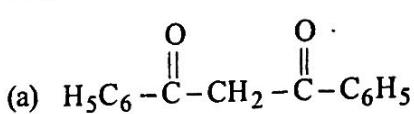
45. The number of optical enantiomorphs of tartaric acid is/are:
 (a) 1 (b) 4 (c) 3 (d) 2

46. How many isomers are possible for the alkane C_4H_{10} ?
 (a) 3 (b) 5 (c) 2 (d) 4

47. Geometrical isomerism is possible in case of:
 (a) pentene-2 (b) propane
 (c) pentane (d) ethene

48. The number of isomers of the compound with molecular formula $C_2H_2Br_2$ is
 (a) 4 (b) 3
 (c) 5 (d) 2

49. The number of ether isomers possible for $C_4H_{10}O$ are:
 (a) 2 (b) 5
 (c) 4 (d) 3

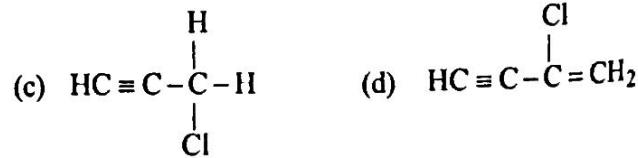
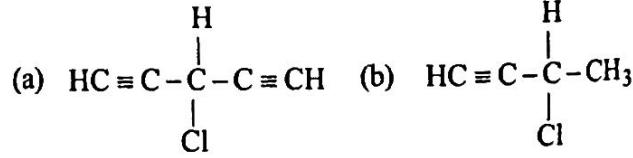


51. Which of the following compounds will show geometrical isomerism?

- (a) 1-phenylpropene (b) propene
 (c) 2-methyl-2-butene (d) 1-butene

52. Isomerism due to rotation around C–C single bond is:

53. Which of the following is most likely to show optical isomerism?



54. Which of the following is a dynamic isomerism?

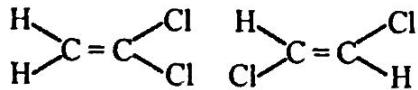
 - (a) Metamerism
 - (b) Geometrical isomerism
 - (c) Tautomerism
 - (d) Co-ordinate isomerism

55. Which is a chiral molecule?
 (a) 2, 2-dimethylbutanoic acid
 (b) 4-methylpentanoic acid
 (c) 3-methylpentanoic acid
 (d) 3,3-dimethylbutanoic acid

56. $\text{CH}_3\text{CH}_2\text{OH}$ and CH_3OCH_3 are the examples of
 (a) chain isomerism (b) functional isomerism
 (c) position isomerism (d) metamerism

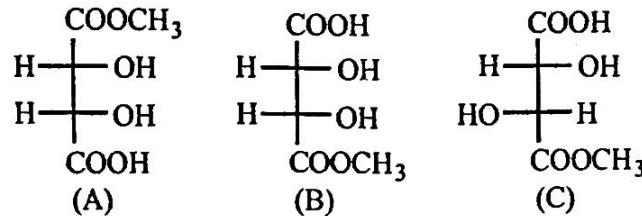
57. Racemic compound has
 (a) equimolar mixture of enantiomers
 (b) 1 : 1 mixture of enantiomer and diastereomer
 (c) 1 : 1 mixture of diastereomers
 (d) 1 : 2 mixture of enantiomers

58. The following compounds differ in



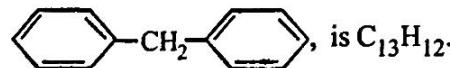
- (a) configuration (b) conformation
 (c) structure (d) chirality

59. The correct statement about the compounds (A), (B) and (C) is :



- (a) (A) and (B) are identical
 (b) (A) and (B) are diastereomers
 (c) (A) and (C) are enantiomers
 (d) (A) and (B) are enantiomers

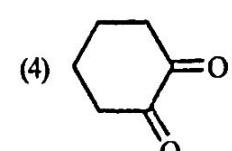
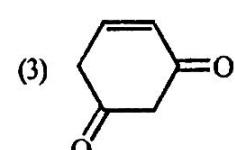
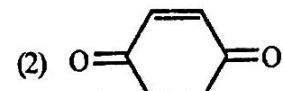
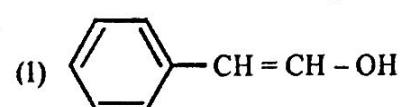
60. The molecular formula of diphenyl methane,



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

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

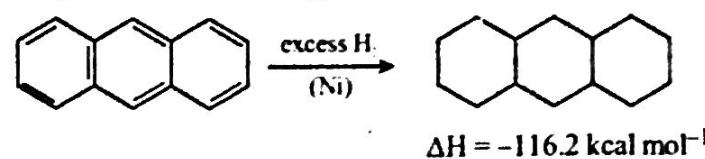
61. Tautomerism is exhibited by –



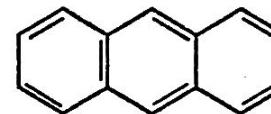
- (a) (1), (3) and (4)
 (b) (2), (3), and (4)
 (c) All of these (d) None of these

Concepts of Reaction Mechanism in Organic Compounds

62. Use the following data to answer the questions below :



Calculate the resonance energy of anthracene.

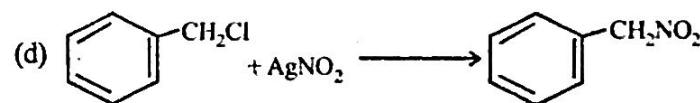
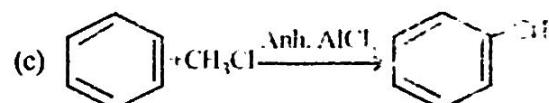
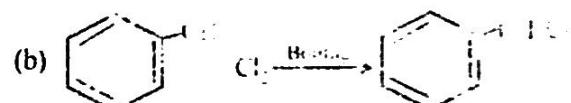
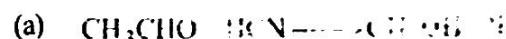


- (a) 84 kcal/mol (b) 100 kcal mol
 (c) 110 kcal/mol (d) 116 kcal mol

63. The most reactive compound for electrophilic nitration is

- (a) Benzene (b) Nitrobenzene
 (c) Benzoic acid (d) Toluene

64. Which one of the following is a nucleophilic substitution reaction?



65. Which of the following undergoes nucleophilic substitution exclusively by S_N1 mechanism?

- (a) Ethyl chloride (b) Isopropyl chloride
 (c) Chlorobenzene (d) Benzyl chloride

66. The correct order regarding the electronegativity of hybrid orbitals of carbon is

- (a) $sp > sp^2 > sp^3$ (b) $sp < sp^2 > sp^3$
 (c) $sp < sp^2 < sp^3$ (d) $sp > sp^2 < sp^3$

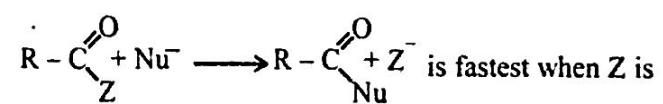
67. In which of the following species is the underlined carbon having sp^3 hybridisation?

- (a) $\text{CH}_3\underline{\text{COOH}}$ (b) $\text{CH}_3\underline{\text{CH}_2}\text{OH}$
 (c) $\text{CH}_3\underline{\text{COCH}_3}$ (d) $\text{CH}_2=\underline{\text{CH}}-\text{CH}_3$

68. Which one of the following does not have sp^2 hybridized carbon?

- (a) Acetonitrile (b) Acetic acid
 (c) Acetone (d) Acetamide

69. Rate of the reaction



- (a) OC_2H_5 (b) NH_2 (c) Cl (d) OCOCH_3

70. The increasing order of stability of the following free radicals is
- $(C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C} < (CH_3)_3\dot{C} < (CH_3)_2\dot{C}H$
 - $(CH_3)_2\dot{C}H < (CH_3)_3\dot{C} < (C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C}$
 - $(CH_3)_2\dot{C}H < (CH_3)_3\dot{C} < (C_6H_5)_2\dot{C}H < (C_6H_5)_3\dot{C}$
 - $(C_6H_5)_3\dot{C} < (C_6H_5)_2\dot{C}H < (CH_3)_3\dot{C} < (CH_3)_2\dot{C}H$
71. Which of the following is strongest nucleophile –
- Br^-
 - $:OH^-$
 - $:CN^-$
 - $C_2H_5\bar{O}^-$
72. The hybridisation of carbon atom in C — C single bond of $H_2C=CH—CH=CH_2$ is :
- $sp^3 — sp$
 - $sp^2 — sp$
 - $sp^2 — sp^2$
 - $sp^3 — sp^3$
73. Which of the following ions is most stable ?
- $CH_3-\overset{+}{C}-CH_3$
 - $CH_3CH_2\overset{+}{C}H_2$
 - $CH_3\overset{+}{C}HCH_2CH_3$
 - None of these
74. Strongest acid among the following is :
- CCl_3COOH
 - CH_3COOH
 - CF_3COOH
 - CBr_3COOH
75. Which of the following is an electrophile ?
- Lewis acid
 - Lewis base
 - Negatively charged species
 - None of the above
76. Strongest acid is
- 2,4,6-trinitrophenol
 - ethanol
 - ether
 - phenol
77. Which one of the following species is isoelectronic with ammonia ?
- CH_2^-
 - $^+CH_2$
 - $^-CH_3$
 - $^+CH_3$
78. What is the meaning of o/p directing group ?
- A group which increases the electron density at m-position
 - No reaction occurs at o/p position
 - A group which increases the electron density at o/p positions when attached to benzene ring and directs the electrophile to these sites.
 - None of these
79. A meta-directing functional group is :
- $-COOH$
 - OH
 - $-CH_3$
 - $-Br$
80. On exciting, Cl_2 molecules by UV light, we get :
- Cl^-
 - Cl^+
 - Cl^-
 - all of these
81. The following compound will undergo electrophilic substitution more readily than benzene :
- Nitrobenzene
 - Benzoic acid
 - Benzaldehyde
 - Phenol
82. Which of the following orders regarding relative stability of free radicals is correct?
- $3^\circ < 2^\circ < 1^\circ$
 - $3^\circ > 2^\circ > 1^\circ$
 - $1^\circ < 2^\circ > 3^\circ$
 - $3^\circ > 2^\circ < 1^\circ$
83. The number of σ and π bonds in a molecule of acetonitrile are respectively
- 2,5
 - 3,4
 - 4,3
 - 5,2
84. Which of the following pairs represent electrophiles?
- $AlCl_3, H_2O$
 - SO_3, NO_2^+
 - BF_3, H_2O
 - NH_3, SO_3
85. How many π -bonds are present in naphthalene?
- 4
 - 5
 - 6
 - 7
86. Electromeric effect is a
- permanent effect
 - temporary effect
 - resonance effect
 - inductive effect
87. Geometry of methyl free-radical is
- pyramidal
 - planar
 - tetrahedral
 - linear
88. In which of the following ways does the hydride ion tend to function ?
- an electrophile
 - a nucleophile
 - a free radical
 - an acid
89. The shape of methyl carbanion is similar to that of –
- BF_3
 - NH_3
 - methyl free radical
 - methyl carbocation
90. The replacement of chlorine of chlorobenzene to give phenol requires drastic conditions, but the chlorine of 2,4-dinitrochlorobenzene is readily replaced since,
- nitro groups make the aromatic ring electron rich at ortho/para positions
 - nitro groups withdraw electrons from the meta position of the aromatic ring
 - nitro groups donate electrons at meta position
 - nitro groups withdraw electrons from ortho/para positions of the aromatic ring
91. Consider the following phenols :
-
- The decreasing order of acidity of the above phenols is
- III > IV > II > I
 - II > I > IV > III
 - I > IV > II > III
 - III > IV > I > II

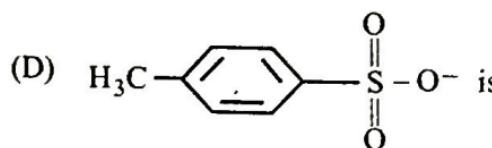
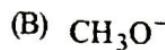
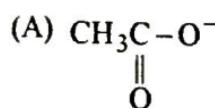
92. Consider the acidity of the carboxylic acids :

- (A) PhCOOH (B) *o*-NO₂C₆H₄COOH
(C) *p*-NO₂C₆H₄COOH (D) *m*-NO₂C₆H₄COOH

Which of the following order is correct ?

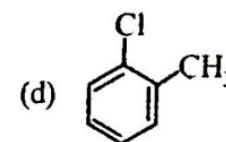
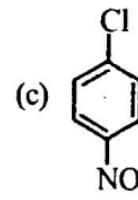
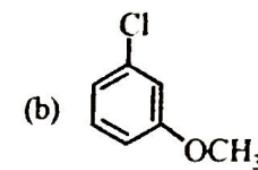
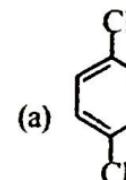
- (a) B > D > A > C (b) B > D > C > A
(c) A > B > C > D (d) B > C > D > A

93. The decreasing order of nucleophilicity among the nucleophiles

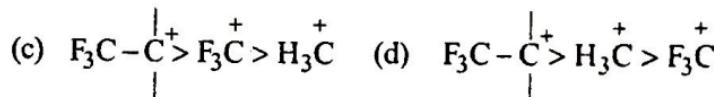
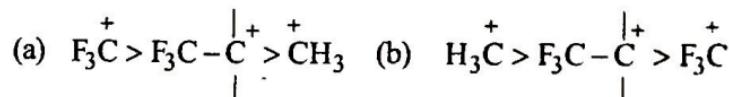


- (a) (C), (B), (A), (D) (b) (B), (C), (A), (D)
(c) (D), (C), (B), (A) (d) (A), (B), (C), (D)

94. Which of the following would react most readily with nucleophiles?



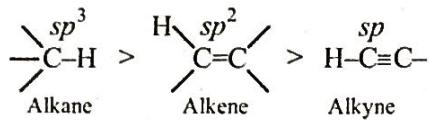
95. Which of the following represents the correct order of stability of the given carbocations ?



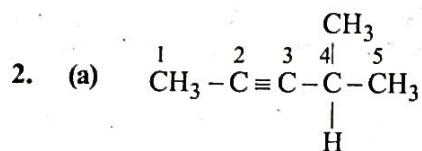
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CONCEPT BANK

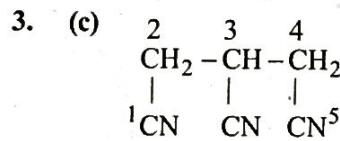
1. (a) Bond order follows the order



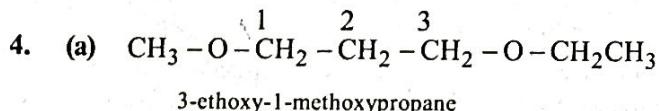
Thus ethane (C_2H_6), being alkane, has longest C-H bond



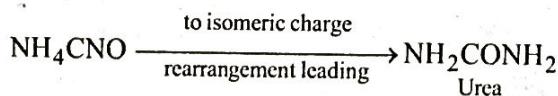
4-methyl-2-pentyne



IUPAC name is 3-cyanopentane-1,5-dinitrile

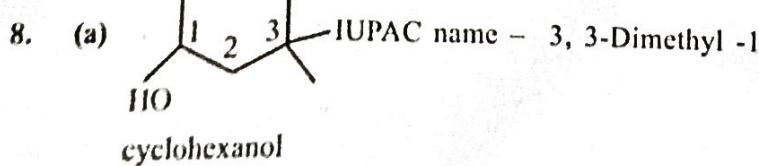
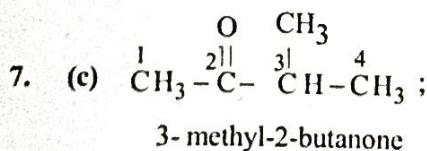


5. (c) The vital force theory suffered first death blow in 1828 when Wohler synthesized the 1st organic compound urea in the laboratory from inorganic compounds reported below :

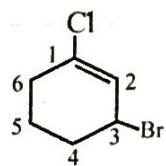


Later on a further blow to vital force theory was given by Kolbe (1845) who prepared acetic acid, the first organic compound, in laboratory from its elements.

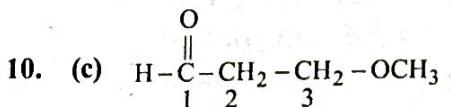
6. (c) The correct name is 3 - methylbutan - 2 - ol



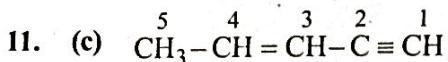
9. (a)



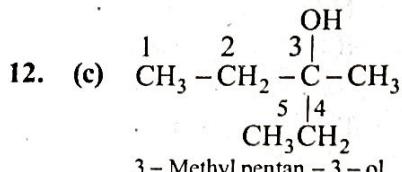
3-bromo-1chlorocyclohexene



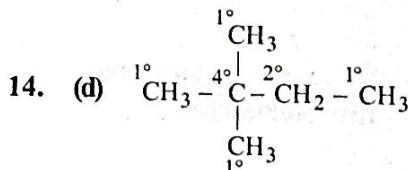
3-methoxypropanal



Pent-3-en-3-yne



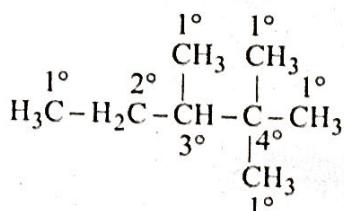
13. (c) The IUPAC name of the compound CH_3CONHBr is N-bromoethanamide.



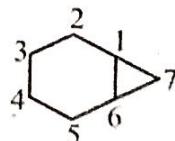
Thus number of secondary hydrogens is two.

15. (a) The IUPAC name of the given compound is 5-chlorohex-2-ene.

16. (d) 2, 2,3-trimethyl pentane



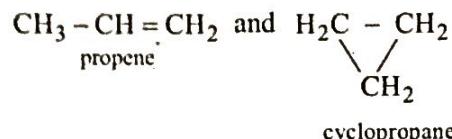
17. (c)



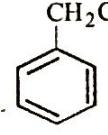
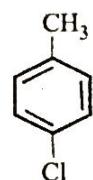
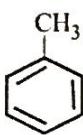
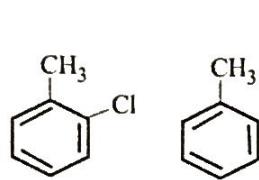
Bicyclo [4, 1, 0] heptane

18. (a) $\text{C}_n\text{H}_{2n}\text{O}_2$ is general formula for carboxylic acid

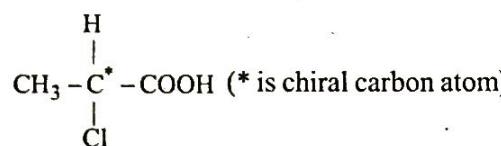
37. (a) C_3H_6 has 2 structural isomers.



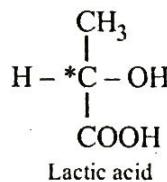
38. (c) C_7H_7Cl has 4 isomers



39. (a) Compounds having chiral carbon atom are optically active.

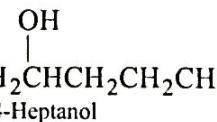
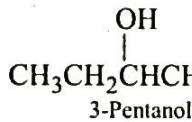
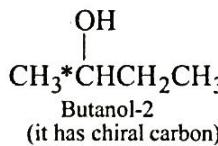


40. (b) No. of optical isomers = 2^x (where x = No. of asymmetric atoms)



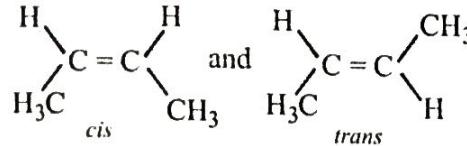
∴ No. of optical isomers of lactic acid = $(2)^1 = 2$

41. (b) $CH_3CH_2CH_2CH_2OH$
Butanol-1



Thus, only 2-butanol has chiral carbon atom, and shows optical isomerism.

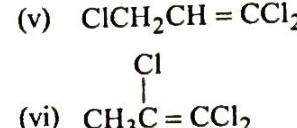
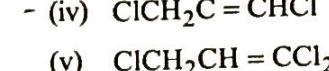
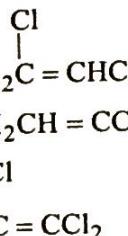
42. (b) Geometrical isomerism is shown by compounds which have C = C and two groups attached to same C atoms are different. Choice (b) fulfills both conditions.



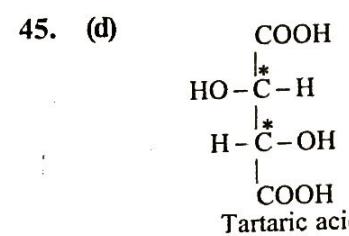
43. (d) The parent hydrocarbon of $C_3H_3Cl_3$ is C_3H_6 , i.e. $^3CH_3^2CH = ^1CH_2$. Three chlorine atoms can be present in following ways.



(iii) $Cl_2CHCH = CH_2Cl$



44. (d) Geometrical isomerism is shown by compounds which have $-C=C-$ or $>C=N-$ or $-N=N-$.



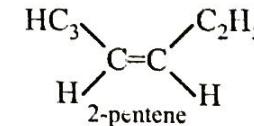
Tartaric acid is an example of a symmetrical molecule, having two asymmetric carbon atoms. In such cases Number of optical enantiomorphs (*d* and *l* isomers) = $2^{(n-1)} = 2^1 = 2$

46. (c) (i) $CH_3-CH_2-CH_2-CH_3$; *n*-butane

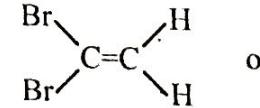


(ii) $CH_3-CH-CH_3$
isobutane

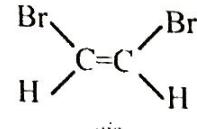
47. (a) Geometrical isomerism is shown by compounds having C = C and the two groups attached to each of carbon atom are different



48. (b) The parent hydrocarbon is C_2H_4 or $CH_2=CH_2$ so, $C_2H_2Br_2$ can be obtained by replacing two H by two Br for which there are three possibilities.



1, 1-dibromoethene



or

cis

1, 2-dibromoethene

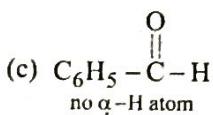
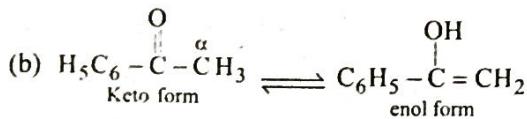
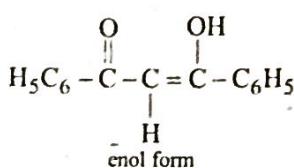
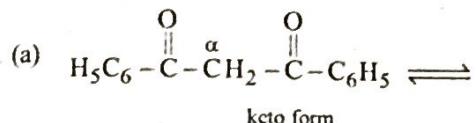
49. (d) (i) $C_2H_5OC_2H_5$
diethyl ether

(ii) $CH_3OCH_2CH_2CH_3$
methyl propyl ether

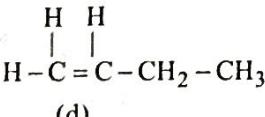
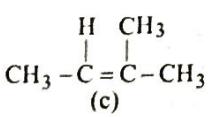
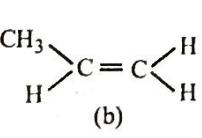
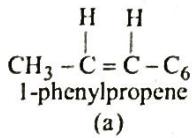
(iii) $CH_3-O-CH-CH_3$

methyl isopropyl ether

50. (d) Keto-enol tautomerism is shown by carbonyl compounds having α -hydrogen atom.



51. (a) Geometrical isomerism is shown by compounds having at least one $C = C$ and two groups attached to each carbon must be different.



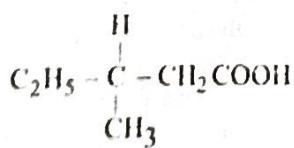
∴ Only (a) fulfills both conditions and shows geometrical isomerism.

52. (c) The free rotation across $C - C$ gives rise to many spatial arrangements. These arrangements are called conformers and property is called conformation.

53. (b) Only compound (b) has a chiral carbon, hence it will show optical isomerism.

54. (c) Tautomerism is a dynamic isomerism. The two forms (keto and enol) of substance can't be separated from each other under usual conditions because they are in dynamic equilibrium.

55. (c) Chiral molecules are those molecules which have atleast one asymmetric carbon atom (a carbon atom attached to 4 different groups). This is true in case of 3-methylpentanoic acid.



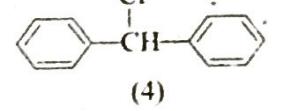
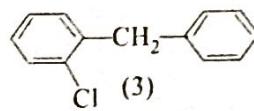
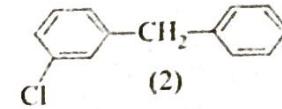
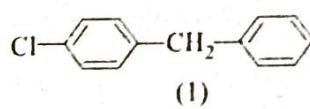
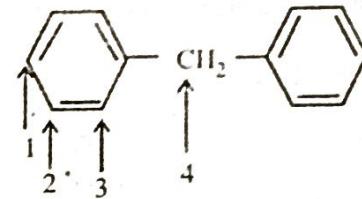
56. (b) Alcohols and ethers are functional isomers.

57. (a) A mixture of equal amounts of the two enantiomers is called a racemic mixture.

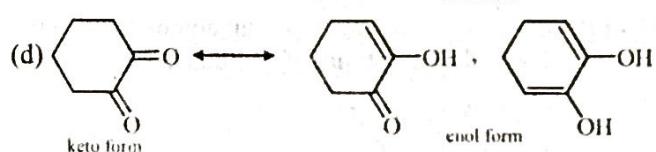
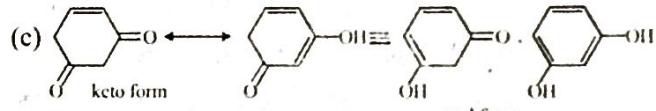
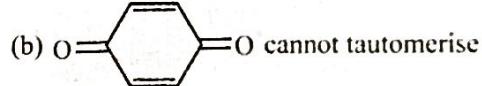
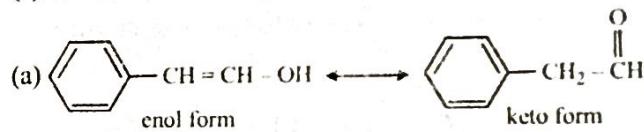
58. (a) Given structures are representing *cis-trans* isomerism (geometrical) hence differ only in configuration.

59. (d) A and B are enantiomers.

60. (b) In diphenylmethane monochlorination at following positions will produce structured isomers



61. (a)



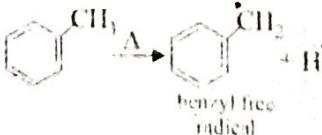
62. (a) Anthracene is 14π e's system i.e., there are 7π bonds. Expected (theoretical) heat of hydrogenation $= -28.6 \times 7 = -200.2$ kcal/mol

Observed (experimental) heat of hydrogenation $= -116.2$

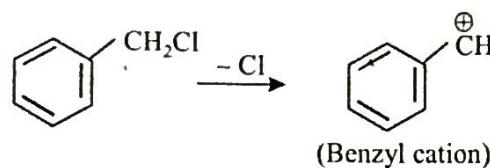
$$\therefore R.E. = E_{\text{observed}} - E_{\text{calculated}} = -116.2 - (-200.2) = 84 \text{ kcal/mol}$$

63. (d) Due to + I-effect of the CH_3 group, toluene has much higher electron density in the ring than benzene, nitrobenzene and benzoic acid as they show - I-effect and hence is most reactive towards nitration.

64. (b) In the presence of UV rays or energy, by boiling chlorine, free radical is generated which attack the methyl carbon atom of the toluene.

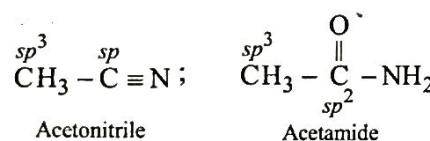
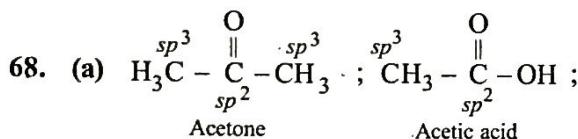


65. (d) S_N1 reactions involve the formation of carbocation, more is stability of carbocation, higher will be the probability of alkyl halide to undergo S_N1 mechanism. Thus decreasing order of S_N1 mechanisms follows order Benzyl > allyl > tertiary alkyl halide > secondary alkyl halide > primary alkyl halides

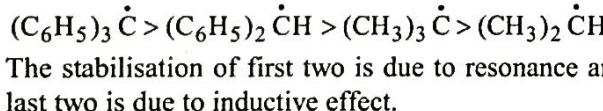


Obtained from S_N1 path. This molecule is resonance stabilised.

66. (a) Among the three given hybrid orbitals, sp hybrid orbital is most electronegative. Contribution of s in sp hybrid orbital is maximum so this orbital is closer to nucleus. Naturally it will have greater tendency to pull electron towards it. Hence it becomes more electronegative and sp^3 becomes least electronegative.
 67. (b) In molecules (a), (c) and (d), the carbon atom has a multiple bond, only (b) has sp^3 hybridization.



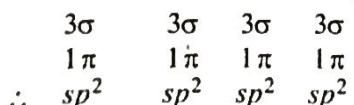
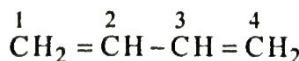
69. (c) Cl^- is the best leaving group among the given option.
 70. (b) The order of stability of free radicals



71. (c) The strength of nucleophile depends upon the nature of alkyl group R on which nucleophile has to attack and also on the nature of solvent. The order of strength of nucleophiles follows the order :
 $CN^- > I^- > C_6H_5O^- > OH^- > Br^- > Cl^-$

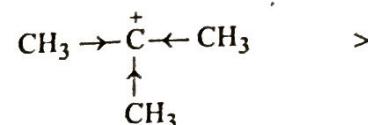
72. (c) Hybridisation on the particular carbon can be established by number of σ and π bonds attached to it.

σ Bond	π Bond	Hybridisation
4	—	sp^3
3	1	sp^2
2	2	sp

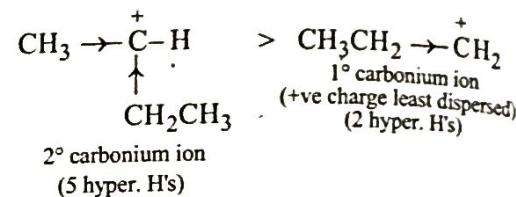


Both carbon atoms forming C—C single bond (C_2 and C_3) are sp^2 hybridised

73. (a) Carbonium ions are electron deficient species. More the number of alkyl groups attached to it, more will be stability due to + I effect.

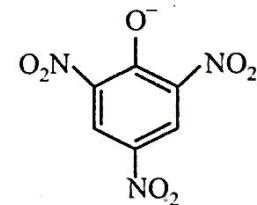


3° carbonium ion
(+ve charge dispersed to maximum extent)
(9 hyperconjugative H's)



Alternatively, above order of stability order can be explained in terms of hyperconjugation.

74. (c) CF_3COOH has highest acidity due to -I effect of F.
 75. (a) Electrophile is positively charged or electron deficient species. Lewis acids are electron acceptors that is electron deficient species.
 76. (a) More is the stability of the conjugate base, higher will be the acidic character of the parent compound



-ve charge highly delocalised
due to -M effect of -NO2 groups

77. (c) Isoelectronic species has same number of electrons. No. of electrons in different species

$$NH_3 = 7 + 3 = 10; \quad \begin{matrix} + \\ CH_2 \end{matrix} = 6 + 2 - 1 = 7$$

$$\begin{matrix} - \\ CH_2 \end{matrix} = 6 + 2 + 1 = 9; \quad \begin{matrix} - \\ CH_3 \end{matrix} = 6 + 3 + 1 = 10$$

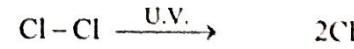
$$\begin{matrix} + \\ CH_3 \end{matrix} = 6 + 3 - 1 = 8$$

78. (c) o, p -Directing groups increase the electron density at o, p -positions in benzene ring. They direct electrophile to o, p -positions.



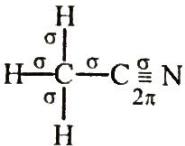
79. (a) In present case, $-C=OH$ is the only group whose key atom (atom attached to benzene carbon) is having a multiple bond (one of the characteristics of m -directing groups).

80. (a) On exposure to UV light, Cl_2 molecule undergoes homolytic fission, to form chlorine free radicals.



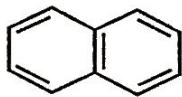
(Chlorine free radicals)

81. (d) Due to +M effect of the -OH group in phenol, electron density in the ortho and para positions of the phenol nucleus increases hence phenol will undergo electrophilic substitution easily than benzene. The other three compounds have electron withdrawing groups, hence they will undergo electrophilic substitution with a difficulty than benzene.
82. (d) Free radicals are stabilized by hyperconjugation, thus 3° free radicals having maximum number of hyperconjugative structures are the most stable, and primary free radical the least.



83. (d) Therefore, the number of σ and π bonds in acetonitrile are 5 and 2 respectively.

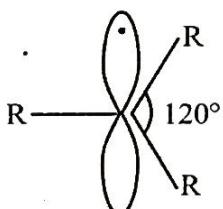
84. (b) Electrophiles are electron deficient or positively charged species.
85. (b) The structural formula of naphthalene is



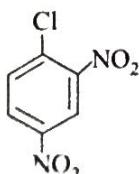
All single bonds are σ -bonds

The double bonds contain 1 σ and 1 π bond since there are 5 double bonds ($\text{C} = \text{C}$) in naphthalene so there are 5 π bonds in it. i.e. is correct option is (b).

86. (b) Electromeric effect is purely a temporary effect and is brought into play only at the requirement of attacking reagent, it vanishes out as soon as the attacking reagent is removed from reaction mixture.
87. (b) The carbon atom of alkyl free radicals which is bonded to only three atoms or groups of atoms is sp^2 -hybridized. Thus free radicals have a planar structure with odd electrons situated in the unused p -orbital at right angles to the plane of hybrid orbitals.

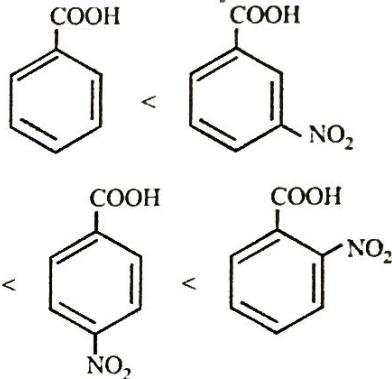


88. (b) Nucleophiles are either negatively charged or neutral species, hence, H^- act as a nucleophile.
89. (b) Methyl carbanion is sp^3 hybridised, with three bond pairs and one lone pair same is the case with NH_3 .
90. (d) $-\text{NO}_2$ group is electron attractive group, so it is able to deactivate the benzene ring.



hence withdrawal of electrons from ortho and para position cause easy removal of -Cl atom due to development of +ve charge on *o*- and *p* positions.

91. (a) Electron withdrawing group ($-\text{NO}_2$) increases acidity while electron releasing group ($-\text{CH}_3$, $-\text{H}$) decreases acidity. Also effect will be more if functional group present at para position then ortho and then meta.
92. (d) In aromatic acids presence of electron withdrawing substituent e.g. $-\text{NO}_2$ disperses the negative charge of the anion and stabilises it and hence increases the acidity of the parent benzoic acid. Further *o*-isomer will have higher acidity than corresponding *m* and *p* isomers. Since nitro group at *p*-position have more pronounced electron withdrawing than $-\text{NO}_2$ group at *m*-position hence the correct order is the one given above.



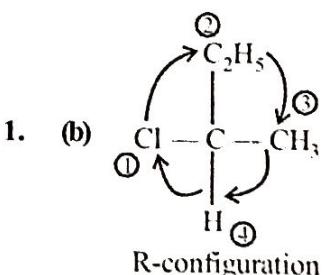
93. (b) The stronger the base the more is the nucleophilic character and vice versa.
Basic character

94. (c) Aryl halides do not undergo nucleophilic substitution under ordinary conditions. The low reactivity of halogen atom in aryl halides is due to resonance. However, aryl halides can be made to undergo nucleophilic substitution either under drastic condition (high temperature, pressure or very strong nucleophiles) or by activating the nuclear halogen by introducing electron withdrawing group e.g. NO_2 , $-\text{CHO}$, CN etc. In the *o*- and *p*- position to the nuclear halogen.

Hence, *p*-nitrochloro benzene would react most readily with nucleophiles.

95. (b) -I group destabilises carbocation and since inductive effect decreases with increasing length of carbon chain. Therefore (b) is the correct option.

PAST ARCHIVES



2. (a) Nucleophilicity increases down the periodic table.
 $\text{I}^- > \text{Br}^- > \text{Cl}^- > \text{F}^-$