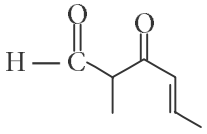
Chapter 12. Organic Chemistry - Some Basis Principles and Techniques

1. The most suitable method of separation of 1 : 1 mixture of *ortho* and *para*-nitrophenols is
(a) chromatography (b) crystallisation
(c) steam distillation (d) sublimation.
(NEET 2017, 1999, 1993)

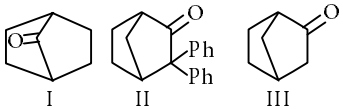
2. The IUPAC name of the compound



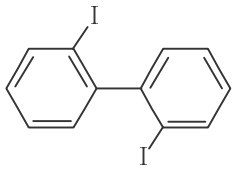
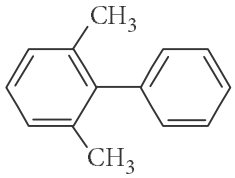
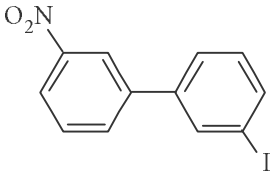
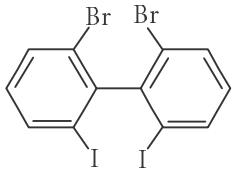
is _____.
(a) 5-formylhex-2-en-3-one
(b) 5-methyl-4-oxohex-2-en-5-al
(c) 3-keto-2-methylhex-5-enal
(d) 3-keto-2-methylhex-4-enal *(NEET 2017)*

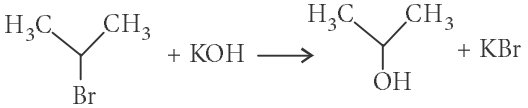
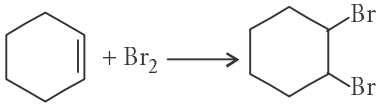
3. The correct statement regarding electrophile is
(a) electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from another electrophile
(b) electrophiles are generally neutral species and can form a bond by accepting a pair of electrons from a nucleophile
(c) electrophile can be either neutral or positively charged species and can form a bond by accepting a pair of electrons from a nucleophile
(d) electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from a nucleophile.
(NEET 2017)

4. Which among the given molecules can exhibit tautomerism?



I II III
(a) III only (b) Both I and III
(c) Both I and II (d) Both II and III
(NEET-II 2016)

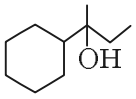
5. Which of the following biphenyls is optically active?
(a) 
(b) 
(c) 
(d) 
(NEET-I 2016)

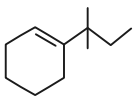
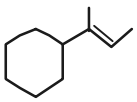
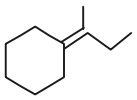
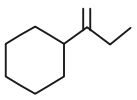
6. For the following reactions :
(A) $CH_3CH_2CH_2Br + KOH \rightarrow CH_3CH{=}CH_2 + KBr + H_2O$
(B) 
(C) 
Which of the following statements is correct?
(a) (A) is elimination, (B) and (C) are substitution reactions.
(b) (A) is substitution, (B) and (C) are addition reactions.

(c) (A) and (B) are elimination reactions and (C) is addition reaction.
(d) (A) is elimination, (B) is substitution and (C) is addition reaction.

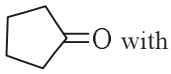
(NEET-I 2016)

7. Which of the following statements is not correct for a nucleophile?
(a) Ammonia is a nucleophile.
(b) Nucleophiles attack low e^- density sites.
(c) Nucleophiles are not electron seeking.
(d) Nucleophile is a Lewis acid. *(2015)*

8. Which of the following is not the product of dehydration of  ?

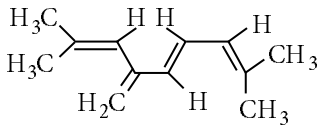
(a) 
(b) 
(c) 
(d) 

(2015)

9. Treatment of cyclopentanone  with methyl lithium gives which of the following species?
(a) Cyclopentanonyl radical
(b) Cyclopentanonyl biradical
(c) Cyclopentanonyl anion
(d) Cyclopentanonyl cation

(2015, Cancelled)

10. The total number of π-bond electrons in the following structure is



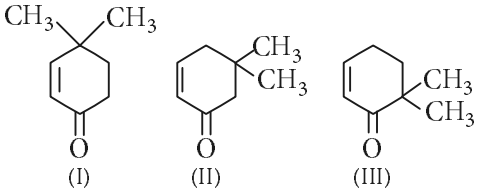
(a) 12 (b) 16
(c) 4 (d) 8

(2015, Cancelled)

11. Which of the following species contains equal number of σ- and π-bonds?
(a) $(CN)_2$ (b) $CH_2(CN)_2$
(c) HCO_3^- (d) XeO_4

(2015, Cancelled)

12. Given :

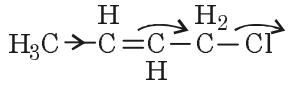
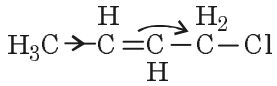
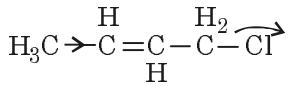
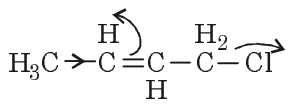


(I) (II) (III)

Which of the given compounds can exhibit tautomerism?
(a) II and III (b) I, II and III
(c) I and II (d) I and III

(2015, Cancelled)

13. Which of the following is the most correct electron displacement for a nucleophilic reaction to take place?

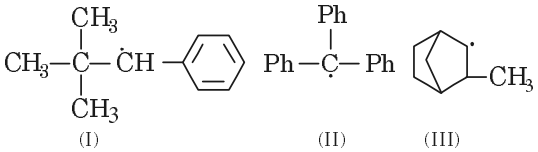
(a) 
(b) 
(c) 
(d) 

(2015, Cancelled)

14. In Duma's method for estimation of nitrogen, 0.25 g of an organic compound gave 40 mL of nitrogen collected at 300 K temperature and 725 mm pressure. If the aqueous tension at 300 K is 25 mm, the percentage of nitrogen in the compound is
(a) 16.76 (b) 15.76
(c) 17.36 (d) 18.20

(2015, Cancelled)

15. Consider the following compounds :

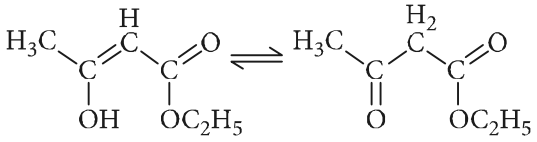


(I) (II) (III)

Hyperconjugation occurs in
(a) III only (b) I and III
(c) I only (d) II only.

(2015, Cancelled)

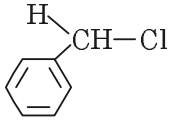
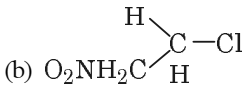
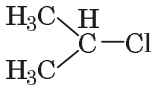
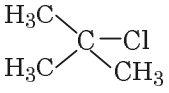
16. The enolic form of ethyl acetoacetate as shown below has



(a) 9 sigma bonds and 2 pi-bonds
(b) 9 sigma bonds and 1 pi-bond
(c) 18 sigma bonds and 2 pi-bonds
(d) 16 sigma bonds and 1 pi-bond.

(2015, Cancelled)

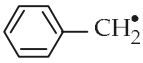
17. In which of the following compounds, the C—Cl bond ionisation shall give most stable carbonium ion?

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

(2015, Cancelled)

18. In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralized 10 mL of 1 M H_2SO_4. The percentage of nitrogen in the soil is

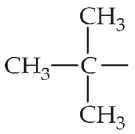
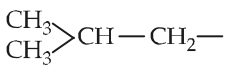
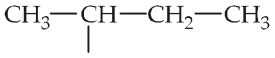
(a) 37.33 (b) 45.33
(c) 35.33 (d) 43.33 *(2014)*

19. The radical,  is aromatic because it has

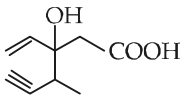
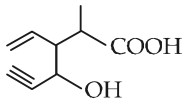
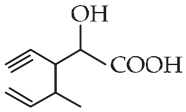
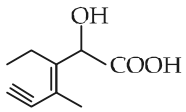
(a) 7 *p*-orbitals and 7 unpaired electrons
(b) 6 *p*-orbitals and 7 unpaired electrons
(c) 6 *p*-orbitals and 6 unpaired electrons
(d) 7 *p*-orbitals and 6 unpaired electrons.

(NEET 2013)

20. The structure of isobutyl group in an organic compound is

(a) $CH_3—CH_2—CH_2—CH_2—$
(b) 
(c) 
(d)  *(NEET 2013)*

21. Structure of the compound whose IUPAC name is 3-Ethyl-2-hydroxy-4-methylhex-3-en-5-ynoic acid is

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

(NEET 2013)

22. Some *meta*-directing substituents in aromatic substitution are given. Which one is most deactivating?

(a) — COOH (b) — NO_2
(c) — C ≡ N (d) — SO_3H

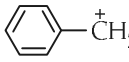
(NEET 2013)

23. Arrange the following in increasing order of stability

1. $(CH_3)_2 — \overset{+}{C} — CH_2 — CH_3$
2. $(CH_3)_3 — \overset{+}{C}$
3. $(CH_3)_2 — \overset{+}{C}H$
4. $CH_3 — \overset{+}{C}H_2$
5. $\overset{+}{C}H_3$

(a) 5 < 4 < 3 < 1 < 2 (b) 4 < 5 < 3 < 1 < 2
(c) 1 < 5 < 4 < 3 < 2 (d) 5 < 4 < 3 < 2 < 1

(Karnataka NEET 2013)

24. What is the hybridisation state of benzyl carbonium ion  ?

(a) sp^2 (b) spd^2
(c) sp^2d (d) sp^3

(Karnataka NEET 2013)

25. Nitrogen detection in an organic compound is carried out by Lassaigne's test. The blue colour formed corresponds to which of the following formulae?

(a) $Fe_3[Fe(CN)_6]_2$ (b) $Fe_4[Fe(CN)_6]_3$
(c) $Fe_4[Fe(CN)_6]_2$ (d) $Fe_3[Fe(CN)_6]_3$

(Karnataka NEET 2013)

26. Homolytic fission of the following alkanes forms free radicals $CH_3 — CH_3$, $CH_3 — CH_2 — CH_3$, $(CH_3)_2CH — CH_3$, $CH_3 — CH_2 — CH(CH_3)_2$. Increasing order of stability of the radicals is

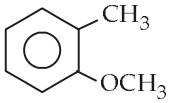
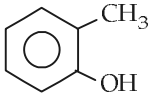
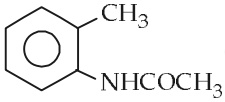
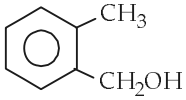
(a) $(CH_3)_2\dot{C} — CH_2CH_3 < CH_3 — \dot{C}H — CH_3 < CH_3 — \dot{C}H_2 < (CH_3)_3C^{\bullet}$
(b) $CH_3 — \dot{C}H_2 < CH_3 — \dot{C}HH — CH_3 < (CH_3)_2\dot{C} — CH_2 — CH_3 < (CH_3)_3\dot{C}$
(c) $CH_3 — \dot{C}H_2 < CH_3 — \dot{C}H — CH_3 < (CH_3)_3\dot{C} < (CH_3)_2\dot{C} — CH_2CH_3$
(d) $(CH_3)_3\ \dot{C} < (CH_3)_2\dot{C} — CH_2CH_3 < CH_3 — \dot{C}H — CH_3 < CH_3 — \dot{C}H_2$

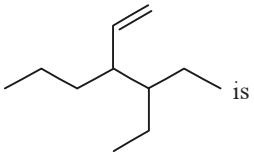
(Karnataka NEET 2013)

27. Among the following compounds the one that is most reactive towards electrophilic nitration is
(a) benzoic acid (b) nitrobenzene
(c) toluene (d) benzene
(2012, 1992)

28. Which nomenclature is not according to IUPAC system?
(a) $Br-CH_2-CH=CH_2$
1-Bromoprop-2-ene
(b) $CH_3-CH_2-\underset{\underset{Br}{|}}{\overset{\overset{CH_3}{|}}{C}}-CH_2-\underset{\underset{CH_3}{|}}{CH}CH_3$
4-Bromo-2,4-dimethylhexane
(c) $CH_3-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{\bigcirc}{|}}{CH}-CH_2CH_3$
2-Methyl-3-phenylpentane
(d) $CH_3-\overset{\overset{O}{||}}{C}-CH_2-CH_2-CH_2COOH$
5-oxohexanoic acid *(2012)*

29. Considering the state of hybridization of carbon atoms, find out the molecule among the following which is linear?
(a) $CH_3-CH=CH-CH_3$
(b) $CH_3-C\equiv C-CH_3$
(c) $CH_2=CH-CH_2-C\equiv CH$
(d) $CH_3-CH_2-CH_2-CH_3$ *(2011)*

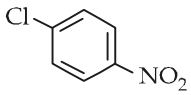
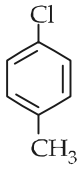
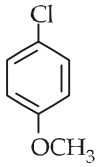
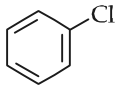
30. Which one of the following is most reactive towards electrophilic reagent?
(a) 
(b) 
(c) 
(d) 
(2011, 2010)

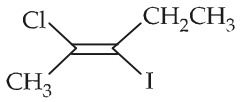
31. The correct IUPAC name for the compound

is
(a) 4-ethyl-3-propylhex-1-ene
(b) 3-ethyl-4-ethenylheptane
(c) 3-ethyl-4-propylhex-5-ene
(d) 3-(1-ethylpropyl)hex-1-ene. *(2011)*

32. In Dumas' method of estimation of nitrogen 0.35 g of an organic compound gave 55 mL of nitrogen collected at 300 K temperature and 715 mm pressure. The percentage composition of nitrogen in the compound would be (aqueous tension at 300 K = 15 mm).
(a) 15.45 (b) 16.45
(c) 17.45 (d) 14.45 *(2011)*

33. Which one is a nucleophilic substitution reaction among the following?
(a) $CH_3-CH=CH_2+H_2O \xrightarrow{H^+} CH_3-\underset{\underset{OH}{|}}{CH}-CH_3$
(b) $RCHO+R'MgX \longrightarrow R-\underset{\underset{OH}{|}}{CH}-R'$
(c) $CH_3-CH_2-\underset{\underset{CH_3}{|}}{CH}-CH_2Br+NH_3 \longrightarrow CH_3-CH_2-\underset{\underset{CH_3}{|}}{CH}-CH_2NH_2$
(d) $CH_3CHO+HCN \longrightarrow CH_3CH(OH)CN$
(2011)

34. The Lassaigne's extract is boiled with conc. HNO_3 while testing for halogens. By doing so it
(a) decomposes Na_2S and NaCN, formed
(b) helps in the precipitation of AgCl
(c) increases the solubility product of AgCl
(d) increases the concentration of NO_3^- ions
(2011)

35. Which of the following compounds undergoes nucleophilic substitution reaction most easily?
(a) 
(b) 
(c) 
(d) 
(Mains 2011)

36. The IUPAC name of the following compound is


(a) *trans*-2-chloro-3-iodo-2-pentene
(b) *cis*-3-iodo-4-chloro-3-pentane
(c) *trans*-3-iodo-4-chloro-3-pentene
(d) *cis*-2-chloro-3-iodo-2-pentene.
(Mains 2011, 1998)

37. Which of the following species is not electrophilic in nature?
(a) $\overset{\oplus}{Cl}$ (b) BH_3
(c) $H_3\overset{\oplus}{O}$ (d) $\overset{\oplus}{N}O_2$
(Mains 2010)

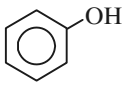
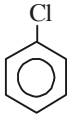
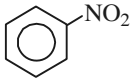
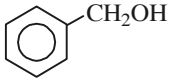
38. The IUPAC name of the compound $CH_3CH{=}CHC{\equiv}CH$ is
(a) pent-4-yn-2-ene (b) pent-3-en-1-yne
(c) pent-2-en-4-yne (d) pent-1-yn-3-ene
(Mains 2010)

39. The IUPAC name of the compound having the formula $CH{\equiv}C{-}CH{=}CH_2$ is
(a) 1-butyne-3-ene (b) but-1-yne-3-ene
(c) 1-butene-3-yne (d) 3-butene-1-yne.
(2009)

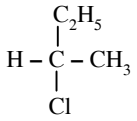
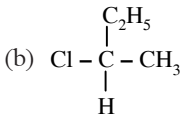
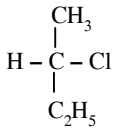
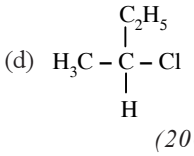
40. Base strength of

$$\underset{(i)}{H_3C\overset{\ominus}{C}H_2},\ \underset{(ii)}{H_2C{=}\overset{\ominus}{C}H}\ \text{and}\ \underset{(iii)}{H{-}C{\equiv}C^{\ominus}}$$

is in the order of
(a) (i) > (iii) > (ii) (b) (i) > (ii) > (iii)
(c) (ii) > (i) > (iii) (d) (iii) > (ii) > (i)
(2008)

41. Which one of the following is most reactive towards electrophilic attack?
(a)  (b) 
(c)  (d) 
(2008)

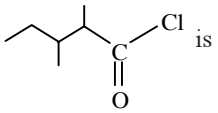
42. The stability of carbanions in the following.
(i) $RC{\equiv}C^{\ominus}$ (ii) 
(iii) $R_2C{=}\overset{\ominus}{C}H$ (iv) $R_3C{-}\overset{\ominus}{C}H_2$
is in the order of
(a) (iv) > (ii) > (iii) > (i)
(b) (i) > (iii) > (ii) > (iv)
(c) (i) > (ii) > (iii) > (iv)
(d) (ii) > (iii) > (iv) > (i) *(2008)*

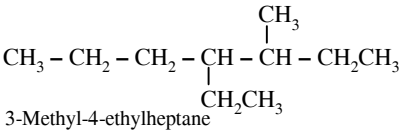
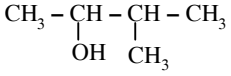
43. $CH_3 - CHCl - CH_2 - CH_3$ has a chiral centre. Which one of the following represents its *R*-configuration?
(a)  (b) 
(c)  (d) 
(2007)

44. For (i) I^-, (ii) Cl^-, (iii) Br^-, the increasing order of nucleophilicity would be
(a) $Cl^- < Br^- < I^-$ (b) $I^- < Cl^- < Br^-$
(c) $Br^- < Cl^- < I^-$ (d) $I^- < Br^- < Cl^-$
(2007)

45. The order of decreasing reactivity towards an electrophilic reagent, for the following would be
(i) benzene (ii) toluene
(iii) chlorobenzene (iv) phenol
(a) (ii) > (iv) > (i) > (iii) (b) (iv) > (iii) > (ii) > (i)
(c) (iv) > (ii) > (i) > (iii) (d) (i) > (ii) > (iii) > (iv)
(2007)

46. The general molecular formula, which represents the homologous series of alkanols is
(a) $C_nH_{2n}O$ (b) $C_nH_{2n}O_2$
(c) $C_nH_{2n+2}O$ (d) $C_nH_{2n+1}O$
(2006)

47. The IUPAC name of  is
(a) 1-chloro-1-oxo-2,3-dimethylpentane
(b) 2-ethyl-3-methylbutanoyl chloride
(c) 2,3-dimethylpentanoyl chloride
(d) 3,4-dimethylpentanoyl chloride. *(2006)*

48. Names of some compounds are given. Which one is not in IUPAC system?
(a) 
3-Methyl-4-ethylheptane
(b) 
3-Methyl-2-butanol

(c) $CH_3 - CH_2 - \underset{\underset{CH_2CH_3}{|}}{\overset{\overset{CH_2}{||}}{C}} - \underset{\underset{CH_3}{|}}{CH} - CH_3$

2-Ethyl-3-methylbut-1-ene

(d) $CH_3 - C \equiv C - CH(CH_3)_2$

4-Methyl-2-pentyne

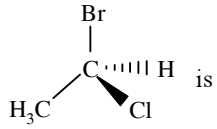
(2005)

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

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

(2005)

50. The chirality of the compound



is

(a) *R* (b) *S*
(c) *E* (d) *Z* *(2005)*

51. Which amongst the following is the most stable carbocation?

(a) $\overset{+}{C}H_3$ (b) $CH_3\overset{+}{C}H_2$

(c) $CH_3 - \underset{\underset{CH_3}{|}}{\overset{+}{C}H}$ (d) $CH_3\overset{CH_3}{\underset{CH_3}{\overset{|}{\underset{|}{C^+}}}}$ *(2005)*

52. 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. *(2005)*

53. The best method for the separation of naphthalene and benzoic acid from their mixture is

(a) distillation (b) sublimation
(c) chromatography (d) crystallisation.

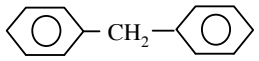
(2005)

54. The – OH group of an alcohol or the – COOH group of a carboxylic acid can be replaced by – Cl using

(a) phosphorus pentachloride
(b) hypochlorous acid
(c) chlorine
(d) hydrochloric acid.

(2004)

55. The molecular formula of diphenyl methane,

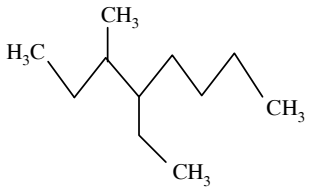


is $C_{13}H_{12}$.

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 *(2004)*

56. Name of the compound given below is



(a) 4-ethyl-3-methyloctane
(b) 3-methyl-4-ethyloctane
(c) 2,3-diethylheptane
(d) 5-ethyl-6-methyloctane *(2003)*

57. Which one of the following orders of acid strength is correct?

(a) *R*COOH > *R*OH > HOH > HC ≡CH
(b) *R*COOH > HOH > *R*OH > HC ≡ CH
(c) *R*COOH > HOH > HC ≡ CH > *R*OH
(d) *R*COOH > HC ≡ CH > HOH > *R*OH

(2003)

58. The percentage of C, H and N in an organic compound are 40%, 13.3% and 46.7% respectively then empirical formula is

(a) $C_3H_{13}N_3$ (b) CH_2N
(c) CH_4N (d) CH_6N

(2002, 1999, 1998)

59. IUPAC name of the following is

$CH_2 = CH - CH_2 - CH_2 - C \equiv CH$

(a) 1,5-hexenyne (b) 1-hexene-5-yne
(c) 1-hexyne-5-ene (d) 1,5-hexynene.

(2002)

60. Geometrical isomers differ in

(a) position of functional group
(b) position of atoms
(c) spatial arrangement of atoms
(d) length of carbon chain. *(2002)*

61. Which of the following is incorrect?

(a) $FeCl_3$ is used in detection of phenol.
(b) Fehling solution is used in detection of glucose.
(c) Tollen's reagent is used in detection of unsaturation.
(d) $NaHSO_3$ is used in detection of carbonyl compound. *(2001)*

62. The incorrect IUPAC name is

(a) $CH_3-\underset{\underset{O}{\|}}{C}-\underset{\underset{CH_3}{|}}{CH}-CH_3$

-2-methyl-3-butanone

(b) $CH_3-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{CH_2CH_3}{|}}{CH}-CH_3$

-2,3-dimethylpentane

(c) $CH_3-C\equiv CCH(CH_3)_2$-4-methyl-2-pentyne

(d) $CH_3\underset{\underset{Cl}{|}}{CH}\underset{\underset{Br}{|}}{CH}CH_3$-3-bromo-2-chlorobutane.

(2001)

63. In steam distillation of toluene, the pressure of toluene in vapour is

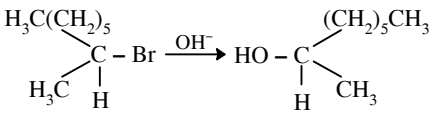
(a) equal to pressure of barometer
(b) less than pressure of barometer
(c) equal to vapour pressure of toluene in simple distillation
(d) more than vapour pressure of toluene in simple distillation. *(2001)*

64. Which one of the following orders is correct regarding the $-I$ effect of the substituents?

(a) $-NR_2 < -OR < -F$ (b) $-NR_2 > -OR > -F$
(c) $-NR_2 < -OR > -F$ (d) $-NR_2 > -OR < -F$

(1998)

65. The following reaction is described as



(a) S_N2 (b) S_N0
(c) S_E2 (d) S_N1 *(1997)*

66. Tautomerism is exhibited by

(a) R_3CNO_2 (b) RCH_2NO_2
(c) $(CH_3)_3CNO$ (d) $(CH_3)_2NH$

(1997)

67. Which of the following technique is most suitable for purification of cyclohexanone from a mixture containing benzoic acid, isoamyl alcohol, cyclohexane and cyclohexanone?

(a) Sublimation (b) Evaporation
(c) Crystallisation (d) IR spectroscopy

(1997)

68. The number of isomers in $C_4H_{10}O$ will be

(a) 7 (b) 8
(c) 5 (d) 6 *(1996)*

69. The IUPAC name of $(CH_3)_2CH-CH_2-CH_2Br$ is

(a) 1-bromo-3-methylbutane
(b) 2-methyl-3-bromopropane
(c) 1-bromopentane
(d) 2-methyl-4-bromobutane. *(1996)*

70. Which of the following is used as an antiknocking material?

(a) Glyoxal (b) Freon
(c) T.E.L. (d) Ethyl alcohol

(1996)

71. In which of the following compounds there is more than one kind of hybridization (sp, sp^2, sp^3) for carbon?

(a) $CH_2=CH-CH=CH_2$
(b) $H-C\equiv C-H$
(c) $CH_3CH_2CH_2CH_3$
(d) $CH_3-CH=CH-CH_3$ *(1995)*

72. The IUPAC name for $CH_3CH=CHCH_2\underset{\underset{NH_2}{|}}{CH}CH_2COOH$ is

(a) 3-amino-5-heptenoic acid
(b) β-amino-δ-heptenoic acid
(c) 5-amino-2-heptenoic acid
(d) 5-amino-hex-2-enecarboxylic acid. *(1995)*

73. Which of the following statements is not correct?

(a) Double bond is shorter than a single bond.
(b) Sigma bond is weaker than a π (pi) bond.
(c) Double bond is stronger than a single bond.
(d) Covalent bond is stronger than hydrogen bond. *(1993)*

74. When the hybridization state of carbon atom changes from sp^3 to sp^2 and finally to sp, the angle between the hybridized orbitals

(a) decreases gradually
(b) decreases considerably
(c) is not affected
(d) increases progressively. *(1993)*

75. Which of the following fertilizers has the highest nitrogen percentage?

(a) Ammonium sulphate
(b) Calcium cyanamide
(c) Urea
(d) Ammonium nitrate *(1993)*

76. The restricted rotation about carbon carbon double bond in 2-butene is due to
(a) overlap of one s and sp^2-hybridized orbitals
(b) overlap of two sp^2-hybridized orbitals
(c) overlap of one p and one sp^2-hybridized orbitals
(d) sideways overlap of two p-orbitals.
(1993)

77. A is a lighter phenol and B is an aromatic carboxylic acid. Separation of a mixture of A and B can be carried out easily by using a solution of
(a) sodium hydroxide
(b) sodium sulphate
(c) calcium chloride
(d) sodium bicarbonate. *(1992)*

78. 2-Methyl-2-butene will be represented as

(a) $CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\underset{|}{\overset{|}{CH}}}}-CH_2CH_3$

(b) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}=CH-CH_3$

(c) $CH_3-CH_2-\underset{\displaystyle CH_3}{\underset{|}{C}}=CH_2$

(d) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH=CH_2$

(1992)

79. The IUPAC name of

$$CH_3-\underset{\displaystyle OH}{\underset{|}{CH}}-CH=\underset{\displaystyle CH_3}{\underset{|}{C}}-CHO$$

(a) 4-hydroxy-1-methylpentanal
(b) 4-hydroxy-2-methylpent-2-en-1al
(c) 2-hydroxy-4-methylpent-3-en-5-al
(d) 2-hydroxy-3-methylpent-2-en-5-al *(1992)*

80. Isomers of a substance must have the same
(a) structural formula
(b) physical properties
(c) chemical properties
(d) molecular formula. *(1991)*

81. Which of the following is the most stable carbocation (carbonium ion)?
(a) $CH_3CH_2^+$ (b) $(CH_3)_2\overset{+}{C}H$
(c) $(CH_3)_3\overset{+}{C}$ (d) $C_6H_5\overset{+}{C}H_2$
(1991)

82. In sodium fusion test of organic compounds, the nitrogen of the organic compound is converted into
(a) sodamide (b) sodium cyanide
(c) sodium nitrite (d) sodium nitrate.
(1991)

83. The shortest C–C bond distance is found in
(a) diamond (b) ethane
(c) benzene (d) acetylene.
(1991)

84. A sp^3 hybrid orbital contains
(a) 1/4 s-character (b) 1/2 s-character
(c) 1/3 s-character (d) 2/3 s-character.
(1991)

85. A straight chain hydrocarbon has the molecular formula C_8H_{10}. The hybridization of the carbon atoms from one end of the chain to the other are respectively sp^3, sp^2, sp^2, sp^3, sp^2, sp^2, sp and sp. The structural formula of the hydrocarbon would be
(a) $CH_3C\equiv CCH_2-CH=CHCH=CH_2$
(b) $CH_3CH_2-CH=CHCH=CHC\equiv CH$
(c) $CH_3CH=CHCH_2-C\equiv CCH=CH_2$
(d) $CH_3CH=CHCH_2-CH=CHC\equiv CH$
(1991)

86. Kjeldahl's method is used in the estimation of
(a) nitrogen (b) halogens
(c) sulphur (d) oxygen.
(1990)

87. An organic compound X(molecular formula $C_6H_7O_2N$) has six carbon atoms in a ring system, two double bonds and a nitro group as substituent, X is
(a) homocyclic but not aromatic
(b) aromatic but not homocyclic
(c) homocyclic and aromatic
(d) heterocyclic and aromatic. *(1990)*

88. 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) $ClCH_2-CH_2Cl$ *(1989)*

89. Which of the following possesses a sp-carbon in its structure?
(a) $CH_2=CCl-CH=CH_2$
(b) $CCl_2=CCl_2$
(c) $CH_2=C=CH_2$
(d) $CH_2=CH-CH=CH_2$ *(1989)*

90. Cyclic hydrocarbon '*A*' has all the carbon and hydrogen atoms in a single plane. All the carbon -carbon bonds have the same length, less than 1.54 Å, but more than 1.34 Å. The bond angle will be
(a) 109°28′ (b) 100°
(c) 180° (d) 120° *(1989)*

91. Lassaigne's test is used in qualitative analysis to detect
(a) nitrogen (b) sulphur
(c) chlorine (d) all of these.
(1989)

92. How many chain isomers could be obtained from the alkane C_6H_{14}?
(a) Four (b) Five
(c) Six (d) Seven
(1988)

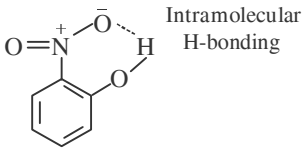
93. The Cl–C–Cl angle in 1, 1, 2, 2-tetrachloroethene and tetrachloromethane respectively will be about
(a) 120° and 109.5° (b) 90° and 109.5°
(c) 109.5°and 90° (d) 109.5° and 120°.
(1988)

Answer Key

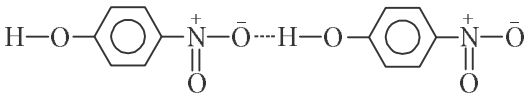
1.	(c)	**2.**	(d)	**3.**	(c)	**4.**	(a)	**5.**	(d)	**6.**	(d)	**7.**	(d)	**8.**	(a)	**9.**	(c)	**10.**	(d)
11.	(d)	**12.**	(b)	**13.**	(a)	**14.**	(a)	**15.**	(a)	**16.**	(c)	**17.**	(d)	**18.**	(a)	**19.**	(c)	**20.**	(c)
21.	(d)	**22.**	(b)	**23.**	(a)	**24.**	(a)	**25.**	(b)	**26.**	(b)	**27.**	(c)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

EXPLANATIONS

1. (c) : The *o*- and *p*-nitrophenols are separated by steam distillation since *o*-isomer is steam volatile due to intramolecular H-bonding while *p*-isomer is not steam volatile due to association of molecules by intermolecular H-bonding.

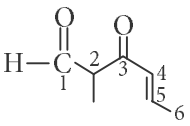


(*o*-Nitrophenol)



Intermolecular
H-bonding
(*p*-Nitrophenol)

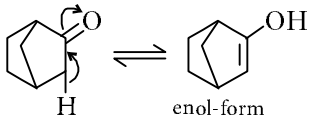
2. (d) :



3-Keto-2-methylhex-4-enal

3. (c)

4. (a) : α-Hydrogen at bridge carbon never participate in tautomerism. Thus, only (III) exhibits tautomerism.



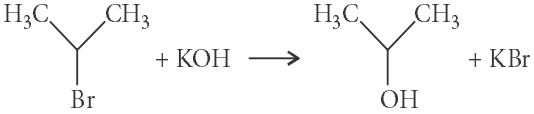
keto-form
(III)

enol-form

5. (d) : *o*-Substituted biphenyls are optically active as both the rings are not in one plane and their mirror images are non-superimposable.

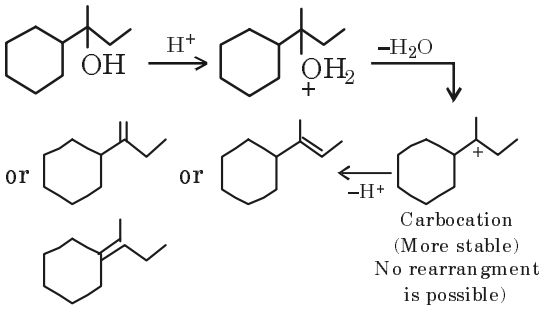
6. (d) : $CH_3CH_2CH_2Br + KOH \longrightarrow CH_3CH{=}CH_2 + KBr + H_2O$

Saturated compound is converted into unsaturated compound by removal of group of atoms hence, it is an elimination reaction.

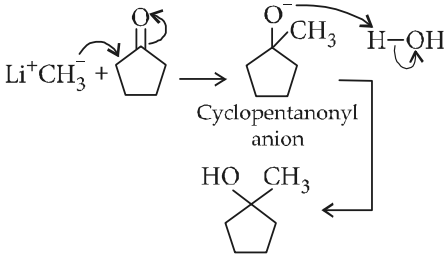


7. (d) : Nucleophiles are electron rich species hence, they are Lewis bases.

8. (a) :

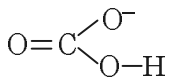


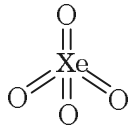
9. (c) :



10. (d) : There are four double bonds. Hence, no. of π-electrons = 2 × 4 = 8

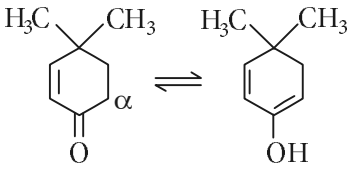
11. (d) : $CH_2(CN)_2$, $N{\equiv}C{-}\underset{\displaystyle H}{\overset{\displaystyle H}{\underset{|}{\overset{|}{C}}}}{-}C{\equiv}N$ $(6\,\sigma + 4\,\pi)$

HCO_3^-,  $(4\,\sigma + 1\,\pi)$

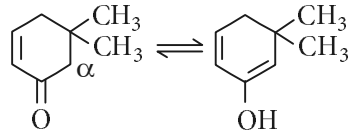
XeO_4,  $(4\,\sigma + 4\,\pi)$

$(CN)_2$, $N{\equiv}C{-}C{\equiv}N$ $(3\,\sigma + 4\,\pi)$

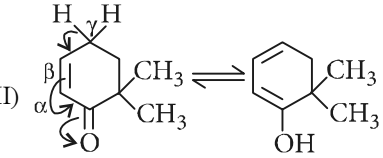
12. (b) : In keto-enol tautomerism,

(I) 

here, α-H participates.

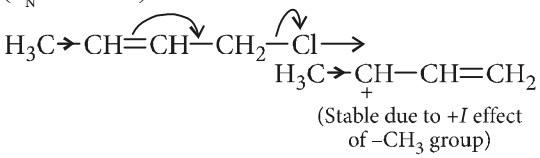
(II) 

here, α-H participates.

(III) 

here, γ-H participates (*p*-tautomerism).

13. (a) : Nucleophile will attack a stable carbocation (S_N1 reaction).



(Stable due to +*I* effect of $-CH_3$ group)

14. (a) : Mass of organic compound = 0.25 g

Experimental values, At STP,

$V_1 = 40$ mL

$V_2 = ?$

$T_1 = 300$ K

$T_2 = 273$ K

$P_1 = 725 - 25 = 700$ mm

$P_2 = 760$ mm

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

$$V_2 = \frac{P_1V_1T_2}{T_1P_2} = \frac{700 \times 40 \times 273}{300 \times 760} = 33.52 \text{ mL}$$

22400 mL of N_2 at STP weighs = 28 g

$$\therefore \quad 33.52 \text{ mL of } N_2 \text{ at STP weighs} = \frac{28 \times 33.52}{22400}$$

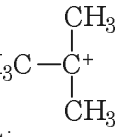
$$= 0.0419 \text{ g}$$

$$\% \text{ of N} = \frac{\text{Mass of nitrogen at STP}}{\text{Mass of organic compound taken}} \times 100$$

$$= \frac{0.0419}{0.25} \times 100 = 16.76\%$$

15. (a) : Hyperconjugation can occur only in compound III as it has α-hydrogen atoms.

16. (c)

17. (d) :  is most stable due to hyperconjugation.

18. (a) : $H_2SO_4 + 2NH_3 \rightarrow (NH_4)_2SO_4$

10 mL of 1 M H_2SO_4 = 10 mmol

$[\because M \times V_{(mL)} = \text{mmol}]$

NH_3 consumed = 20 mmol

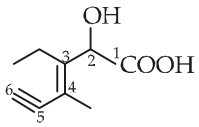
Acid used for the absorption of ammonia

= 20 – 10 mmol

= 10 mL of 2 N (or 1 M) H_2SO_4

$$\% \text{ of N} = \frac{1.4 \times N \times V}{W} = \frac{1.4 \times 2 \times 10}{0.75} = 37.33\%$$

19. (c) **20. (c)**

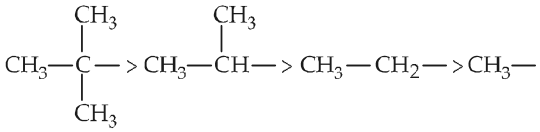
21. (d) : 

IUPAC name of the structure is 3-Ethyl-2-hydroxy-4-methylhex-3-en-5-ynoic acid.

22. (b) : $-NO_2$ is most deactivating due to $-I$ and $-M$ effect.

23. (a) : Greater the number of electron donating alkyl groups (+*I* effect), greater is the stability of carbocations.

+*I* effect is in the order :



Hence the order of stability of carbocations is

5 < 4 < 3 < 1 < 2

24. (a)

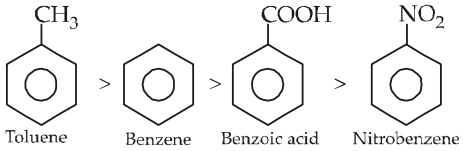
25. (b) : $3Na_4[Fe(CN)_6] + 2Fe_2(SO_4)_3 \rightarrow$

Sodium ferrocyanide

$Fe_4[Fe(CN)_6]_3$ Ferric ferrocyanide (Prussian blue) $+ 6Na_2SO_4$

26. (b) : More the number of hyperconjugative structures, the greater is the stability.

27. (c) : As the +*I* effect increases reactivity towards electrophilic reactions increases and as –*I* or –*M* effect increases reactivity towards electrophilic reactions decreases. Thus, the order is



28. (a) : $Br-\overset{3}{C}H_2-\overset{2}{C}H=\overset{1}{C}H_2$

3-Bromopropene

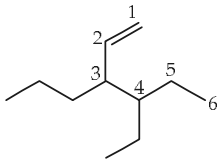
29. (b) : $CH_3-C\equiv C-CH_3$

In case of sp^3 hybridised carbon, bond angle is 109° 28′; sp^2 hybridised carbon, bond angle is 120° and *sp* hybridised carbon, bond angle is 180°.

So, only $\underset{sp}{CH_3}-\underset{sp}{C}\equiv\underset{sp}{C}-CH_3$ is linear.

30. (b) : $+R$ effect of – OH group is greater than that of $-OCH_3$ group.

31. (a) :



32. (b) : Given $V_1 = 55$ mL, $V_2 = ?$

$P_1 = 715 - 15 = 700$ mm, $P_2 = 760$ mm

$T_1 = 300$ K, $T_2 = 273$ K

General gas equation, $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

Volume of nitrogen at STP,

$$V_2 = \frac{P_1V_1T_2}{P_2T_1} = \frac{700\times55\times273}{760\times300} = 46.099 \text{ mL}$$

% of nitrogen = $\frac{V_2}{8W}$, were W = the mass of organic compound.

$$\% \text{ of N} = \frac{46.099}{8\times0.35} = 16.46$$

33. (c) : Nucleophilic substitution reaction involves the displacement of a nucleophile by another.

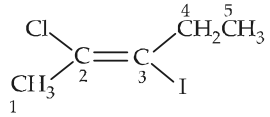
34. (a) : In case of Lassaigne's test of halogens, it is necessary to remove sodium cyanide and sodium sulphide from the sodium extract if nitrogen and sulphur are present. This is done by boiling the sodium extract with conc. HNO_3.

$NaCN + HNO_3 \rightarrow NaNO_3 + HCN\uparrow$

$Na_2S + 2HNO_3 \rightarrow 2NaNO_3 + H_2S\uparrow$

35. (a) : Electron withdrawing groups like $-NO_2$ facilitates nucleophilic substitution reaction in chlorobenzene.

36. (a) :



trans-2-chloro-3-iodo-2-pentene

37. (c)

38. (b) : $\overset{5}{C}H_3\overset{4}{C}H=\overset{3}{C}H\overset{2}{C}\equiv\overset{1}{C}H$

Pent-3-en-1-yne

Fact : If a molecule contains both carbon-carbon double or triple bonds, the two are treated as per in seeking the lowest number combination. However, if the sum of numbers turns out to be the same starting from either of the carbon chain, then lowest number is given to the C=C double bond.

39. (c) : $\overset{4}{C}H\equiv\overset{3}{C}-\overset{2}{C}H=\overset{1}{C}H_2$

1-Butene-3-yne

Since the sum of numbers starting from either side of the carbon chain turns out to be the same, so lowest number is given to the C=C end.

40. (b) : $\underset{sp}{H-C}\equiv\underset{sp}{C}-H > \underset{sp^2}{CH_2}=\underset{sp^2}{CH_2} > \underset{sp^3}{CH_3CH_3}$

(Acidic character)

Conjugate base of the given acid :

$$\overset{\ominus}{C}\equiv C-H < \overset{\ominus}{C}H=CH_2 < \overset{\ominus}{C}H_2CH_3$$

(Basic character)

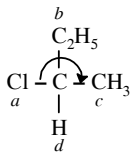
Conjugate base of stronger acid is weaker and *vice versa*.

41. (a) : Groups like, –Cl and $-NO_2$ shows $-I$ effect. $-I$ groups attached to the benzene ring decrease the electron density and hence less prone to electrophilic attack. –OH not only shows $-I$ effect but also $+M$ effect which predominates the $-I$ character and electron density is increased in the benzene ring which facilitates electrophilic attack.

42. (c) : Higher the no. of electron releasing group lower will be stability of carbanion, and vice versa. So the order of stability of carbanions is

$$RC\equiv\overset{\ominus}{C} > \text{  } > R_2C=\overset{-}{C}H > R_3C-\overset{-}{C}H_2$$

43. (b) :



R-configuration

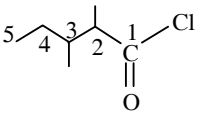
44. (a) : In case of different nucleophiles, but present in the same group in the periodic table, then larger is the atomic mass, higher is the nucleophilicity. Hence the decreasing order of nucleophilicity of the halide ions is

$I^- > Br^- > Cl^- > F^-$.

45. (c) : Electrophiles are electron loving chemical species. They attack at the highest electron-density site of the substrate. Electron donating substances (+*I* effect) increases the electron density of the molecule. +*I* effect decreases in the order
$-OH > -CH_3 > -H > -Cl$.
Hence order of decreasing reactivity towards electrophile is
$C_6H_5OH > C_6H_5CH_3 > C_6H_6 > C_6H_5Cl$.

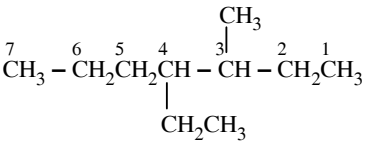
46. (c) : General molecular formula for alkanols is $C_nH_{2n+2}O$ or $[C_nH_{2n+1}OH]$.

47. (c) :



It is 2,3-dimethylpentanoyl chloride.

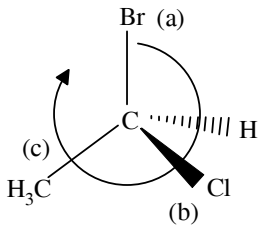
48. (a) :



4-Ethyl-3-methylheptane

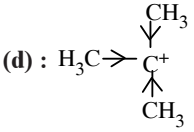
49. (d) : S_N1 reaction is favoured by heavy (bulky) groups on the carbon atom attached to halogens and nature of carbonium ion in substrate is
Benzyl > Allyl > Tertiary > Secondary > Primary > Methyl halides.

50. (a) :



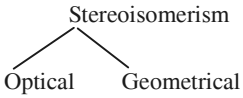
Lowest priority atom is always away from the viewer. Priority is seen on the basis of atomic no. and if atomic no. are same then on the basis of atomic mass. See in the order of higher to lower priority.
If clockwise then it is *R*.
If anticlockwise then it is *S*.
Full name of the molecule is
(*R*) 1-bromo-1-chloroethane.

51. (d) :



3°C is more stable due to the stabilization of the charge by three methyl groups (or inductive effect). It can also be explained on the basis of hyperconjugation.

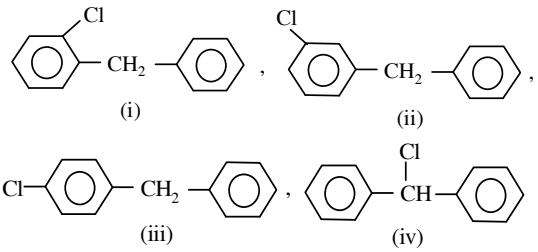
52. (b) :



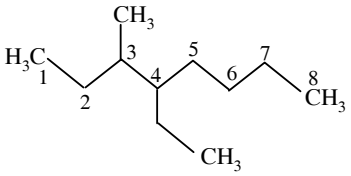
53. (b): Sublimation method is used for those organic substances which pass directly from solid to vapour state on heating and vice-versa on cooling. e.g. benzoic acid, naphthalene, camphor, anthracene, etc. Naphthalene is volatile and benzoic acid is non-volatile due to the formation of the dimer.

54. (a) : $ROH + PCl_5 \rightarrow RCl + POCl_3 + HCl$
$RCOOH + PCl_5 \rightarrow RCOCl + POCl_3 + HCl$

55. (b) : Only four structural isomers are possible for diphenyl methane.



56. (a) :



4-ethyl-3-methyloctane

57. (b) : Carboxylic acid is much stronger than water and alcohol. Since the carboxylate ion after the removal of proton is stabilised by resonating structures. The – OH in alcohols is almost neutral. Acetylene is also weakest acid.

58. (c) :

S. No.	Element	%	At. mass	Relative no. of atoms	Simplest ratio of atoms
1.	C	40	12	$\frac{40}{12}=3.33$	$\frac{3.33}{3.3}=1$
2.	H	13.3	1	$\frac{13.3}{1}=13.3$	$\frac{13.3}{3.3}=4$
3.	N	46.7	14	$\frac{46.7}{14}=3.3$	$\frac{3.3}{3.3}=1$

Therefore, empirical formula is CH_4N

59. (b) : $\overset{1}{CH_2}=\overset{2}{CH}-\overset{3}{CH_2}-\overset{4}{CH_2}-\overset{5}{C}\equiv\overset{6}{CH}$
The double bond gets priority over triple bond. Therefore correct IUPAC name is 1-hexene-5-yne.

60. (c) : Geometrical isomers are those isomers which possess the same molecular and structural formula but differ in the arrangement of atoms or groups in space due to hindered rotation around the double bonded atoms.

61. (c) : Tollen's reagent is a solution of ammoniacal silver nitrate and used for the detection of –CHO group. Aldehydes reduce Tollen's reagent and itself get oxidised to give Ag^+ ions to Ag powder which forms the silver coloured mirror in the test tube. So this test is also known as silver mirror test.

$R - CHO + [Ag(NH_3)_2]^+ \rightarrow R\text{–}COO^- + Ag$ (Powder)

62. (a) : $\overset{4}{C}H_3 - \overset{3}{C}(=O) - \overset{2}{C}H(CH_3) - \overset{1}{C}H_3$ (wrong numbering)

The $-\overset{O}{\overset{\|}{C}}-$ group should get priority over methyl group.

∴ Correct IUPAC name is

$\overset{1}{C}H_3 - \overset{2}{C}(=O) - \overset{3}{C}H(CH_3) - \overset{4}{C}H_3$ 3-Methyl-2-butanone

63. (b) : Steam distillation is essentially Co-distillation with water and is carried out when a solid or liquid is insoluble in water and is volatile with steam but the impurities are non-volatile.

64. (a) : The electronegativity of F, O, and N follows the order: N < O < F

Therefore the negative inductive effect of $-NR_2$, $-OR$ and –F follows the order:

$-NR_2 < -OR < -F$

65. (a) : S_N2 reaction are bimolecular reactions where rate of reaction depends on the concentration of both substrate and nucleophile. When OH^- attacks the substrate from the opposite side of the leaving group *i.e.*, Br^- a transition state results, to which both OH and Br are partially bonded to carbon atom.

66. (b) : It is a special type of functional isomerism, in which both the isomers are represented by one and the same substance and are always present in equilibrium. It is exhibited by nitroalkane (RCH_2NO_2) and isonitroalkane.

67. (d) : In the IR spectroscopy, each functional group appears at a certain peak (in cm^{-1}). So, cyclohexanone can be identified by carbonyl peak.

68. (a) : There are 7 isomers in $C_4H_{10}O$. Out of these, 4 are alcohols and 3 are ethers.

$CH_3CH_2 - O - CH_2CH_3$, $CH_3OCH_2CH_2CH_3$,

$CH_3OCH(CH_3)_2$

$CH_3CH_2CH_2CH_2OH$, $CH_3CH_2CH(OH)CH_3$

$(CH_3)_2CH - CH_2OH$, $CH_3 - C(CH_3)_2 - OH$

69. (a) : $H_3C - CH(CH_3) - CH_2 - CH_2 - Br$

1-Bromo-3-methylbutane

70. (c) : Tetraethyl lead $(C_2H_5)_4Pb$, is used as an antiknocking agent in gasoline used for running automobiles.

71. (d) : $\underset{sp^3}{CH_3} - \underset{sp^2}{CH} = \underset{sp^2}{CH} - \underset{sp^3}{CH_3}$

72. (a) :

$\overset{7}{C}H_3 - \overset{6}{C}H = \overset{5}{C}H - \overset{4}{C}H_2 - \overset{3}{C}H(NH_2) - \overset{2}{C}H_2 - \overset{1}{C}OOH$

As – COOH group is highest priority group, it is numbered one. So, the IUPAC name is 3-amino-5-heptenoic acid.

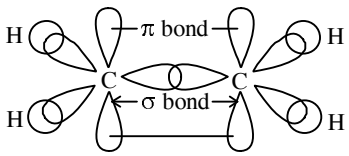
73. (b) : Sigma bond is stronger than π-bond because of better overlap. All single bonds are σ bonds and all multiple bonds contain one σ and other π bonds.

74. (d) : Angle increases progressively

$sp^3(109°28')$, $sp^2(120°)$, $sp(180°)$

75. (c) : Urea (46.6% N). % of N in other compounds are : $(NH_4)_2SO_4$ = 21.2%; $CaCN_2$ = 35.0% and NH_4NO_3 = 35.0%

76. (d) : $>C=C<$,



Restricted rotation is due to sideways overlap of two *p*-orbitals.

77. (d) : Carboxylic acids dissolve in $NaHCO_3$ but phenols do not.

78. (b) : $\overset{1}{C}H_3 - \overset{2}{C}(CH_3) = \overset{3}{C}H - \overset{4}{C}H_3$

2-Methyl-2-butene

79. (b) : $\overset{5}{C}H_3 - \overset{4}{C}H(OH) - \overset{3}{C}H = \overset{2}{C}(CH_3) - \overset{1}{C}HO$

4-Hydroxy-2-methylpent-2-en-1-al

80. (d) : Isomers must have same molecular formula but different structural formula.

81. (c) : 3° > 2° > 1° more the delocalisation of positive charge, more is its stability.

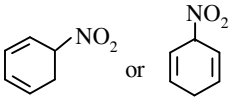
82. (b) : Sodium cyanide (Na + C + N → NaCN).

83. (d) : Shortest C–C distance (1.20 Å) is in acetylene.

84. (a) : sp^3 orbital has 1/4 (25%) *s*-character.

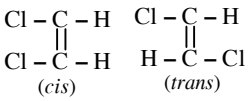
85. (d) : $\overset{sp^3}{CH_3}\overset{sp^2}{CH}=\overset{sp^2}{CH}\overset{sp^3}{CH_2}-\overset{sp^2}{CH}=\overset{sp^2}{CH}\overset{sp}{C}\equiv\overset{sp}{CH}$

86. (a)

87. (a) :  or

Hence it is homocyclic (as the ring system is made of one type of atoms, *i.e.*, carbon) but not aromatic.

88. (c) :



(*cis*) (*trans*)

1, 2-dichloroethene exhibits *cis-trans* (geometrical) isomerism.

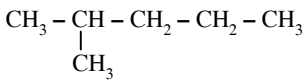
89. (c) : $\overset{sp^2}{CH_2}=\overset{sp}{C}=\overset{sp^2}{CH_2}$

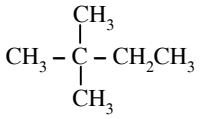
90. (d) : All the properties mentioned in the question suggest that it is a benzene molecule. Since in benzene all carbons are sp^2-hybridized, therefore, C – C – C angle is 120°.

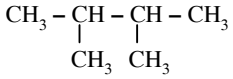
91. (d) : All the three (N, S, halogens).

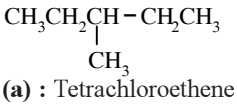
92. (b) : 5-chain isomers are obtained from alkane C_6H_{14}.

(i) $CH_3CH_2CH_2CH_2CH_2CH_3$

(ii) 

(iii) 

(iv) 

(v) 

93. (a) : Tetrachloroethene being an alkene has sp^2-hybridized C-atoms and hence the angle Cl – C – Cl is 120° while in tetrachloromethane, carbon is sp^3 hybridized, therefore the angle Cl – C – Cl is 109°28′.