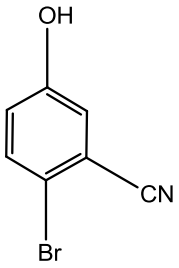
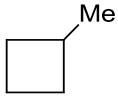
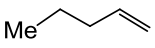
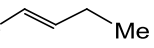
Single Correct Answer Type

1. How many chiral compound are possible on mono chlorination of 2-methyl butane?
   a) 2 b) 4 c) 6 d) 8
2. Forty millilitre of CO was mixed with 100 ml of O_2 and the mixture was exploded. On cooling, the reaction mixture was shaken with KOH. What volume of gas is left?
   a) 60ml of O_2 b) 80 ml of O_2 c) 20 ml of CO d) 40 ml of CO_2
3. A certain compound has the molecular formula X_4O_6. If 10 gm of X_4O_6 has 5.72 gm X, the atomic mass of X is:
   a) 32 amu b) 37 amu c) 42 amu d) 98 amu
4. The number of σ- and π-bonds in 5-oxohexanoic acid, respectively, is:
   a) 18,2 b) 18,1 c) 17,2 d) 17,1
5. An organic compound contains 4% sulphur. Its minimum molecular weight is:
   a) 200 b) 400 c) 800 d) 1600
6. The IUPAC name of the following compound, is



   a) 4-bromo-3-cynophenoal b) 2-bromo-5-hydroxybenzonitrile
   c) 2-cyano-4-hydroxybromobenzene d) 6-bromo-3-hydroxybenzonitrile
7. An enantiomerically pure acid is treated with racemic mixture of an alcohol having one chiral carbon. The ester formed will be
   a) Optically active mixture b) Pure enantiomer
   c) Meso compound d) Racemic mixture
8. Which of the following is a soft base?
   a) CO b) CO_3^{2-} c) Cl^{3+} d) Pb^{2+}
9. A compound (A) with molecular formula C_5H_{10} gives one monochlorination product. Compound (A) is:
   a) 

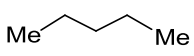
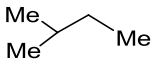
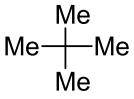
   b) 
   c) 

   d) 

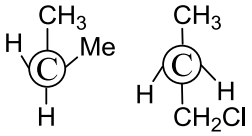
10. Which of the following carbocations is least stable?
    a) $\overset{\oplus}{C}H_2Ph$ b) $\overset{\oplus}{C}H_2{=}CH_2$ c) $Me_2\overset{\oplus}{C}H$ d) $CH_2{=}CH{-}\overset{\oplus}{C}H_2$
11. The process of separation of racemic modifications into d and l enantiomers is called:
    a) Resolution b) Dehydration c) Revolution d) Dehydrohalogenation
12. Give the decreasing order of hyperconjugative effect of R in $R-CH=CH_2$, where R is:
    I. Me − II. Et − III. Me_2CH − IV. Me_3C −
    a) I > *II* > *III* > *IV* b) IV > *III* > *II* > *I* c) II > *I* > *III* > *IV* d) IV > *III* > *I* > *II*
13. Two litre air formed 1915 ml of ozonised air when passed through Brodio's apparatus. The volume of ozone formed is:
    a) 85 ml b) 170 ml c) 225 ml d) 42.5 ml
14. The decreasing order of – I effect of the orbitals is:
    I. sp II. sp^2 III. sp^3
    a) I > *II* > *III* b) III > *II* > *I* c) I > *III* > *II* d) II > III > *I*
15. The minimum number of carbon atoms an alkane should contain in order to exihibit optical activity is:

a) 5 b) 6 c) 7 d) 8

16. An alkane (A) having a molecular mass of 72 produces one monochlorination product. Compound (A) is:

a)  b)  c)  d) 

17. The pair of structures given below represents:

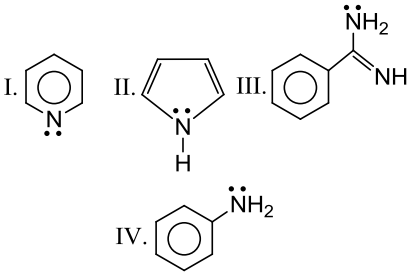


a) Enantiomers b) Position isomers c) Conformers d) None of these

18. The decreasing order of reactivity of the following alkenes is:
i. 2, 3-Dimethyl-2-butene ii. 2-Methyl-2-butene
iii. 2-Butene iv. Ethene
a) (iv) > (iii) > (ii) > (i) b) (i) > (ii) > (iii) > (iv)
c) (iv) > (ii) > (iii) > (i) d) (i) > (iii) > (ii) > (iv)

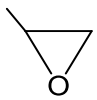
19. The decreasing order of – I effect of the following is:
I. COOHII. FIII. ORIV. OHV. Ph −
a) I > II > III > IV > V > VI b) II > I > III > IV > V > VI
c) I > II > V > III > IV > VI d) II > I > V > III > IV > VI

20. The decreasing order of basic characters of the following is:



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

21. Which of the following is oxetane?

a)  b)  c)  d) 

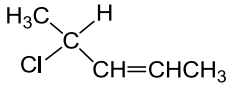
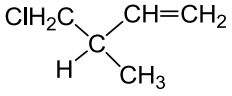
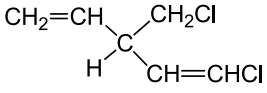
22. Which of the following compounds will not show geometrical isomerism?
a) 3-Phenyl-2-propenoic acid b) 2-Butene
c) 3-Methyl-2-butenoic acid d) 3-Methyl-2-pentenoic acid

23. The total number of alkenes possible by dehydromination of 3-bromo-3-cyclopentylhexane using alcoholic KOH is
a) 1 b) 3 c) 5 d) 7

24. An organic compound contains 66% C and 13.3% H. Its vapour density is 37. The possible number of isomers of all types for the compound is:
a) 6 b) 7 c) 5 d) 8

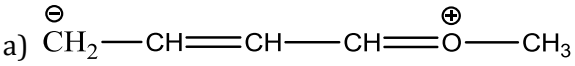
25. The total number of cyclic structural as well as stero isomers possible for a compound with the molecular formula C_5H_{10} is
a) 2 b) 4 c) 6 d) 7

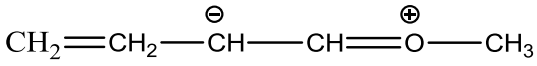
26. Which of the following will not show geometrical isomerism?

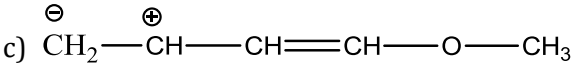
a)  b)  c)  d) $CH_3CH = CHCH_2CH_3$

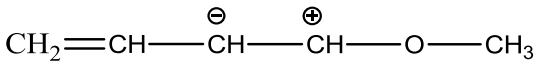
27. In 3-chloro cyclohexanol, the primary prefix is:
a) 3-Chloro b) Cyclo c) an(e) d) -ol

28. Which of the following resonating structures of 1-methoxy-1, 3-butadiene is least stable?

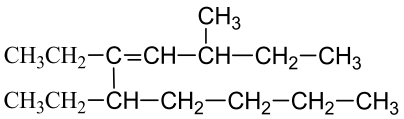
a) 

b) 

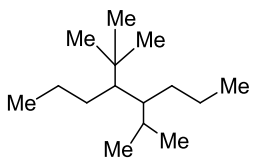
c) 

d) 

29. Butene when treated with chlorine at about 500°C forms:
    a) $MeCH_2CHCl - CH_2Cl$ b) $MeCH(Cl) - CH = CH_2$
    c) $ClCH_2CH_2CH = CH_2$ d) $MeC(Cl_2)CH = CH_2$
30. An organic compound on analysis gave C = 42.8%, H = 720%, and N = 50%. Volume of 1 gm of the compound was found to be 200 ml at STP. Molecular formula of the compound is:
    a) $C_4H_8N_4$ b) $C_{16}H_{32}N_{16}$ c) $C_{12}H_{24}N_{12}$ d) $C_2H_4N_2$
31. The decreasing order of acidic character of the following is:
    I. CH_3SH II. CH_3OH III. H_2O IV. EtOH
    a) I > *II* > *III* > *IV* b) IV > *III* > *II* > *I* c) I > *III* > *II* > *IV* d) III > *I* > *II* > *IV*
32. Which of the following is not an isomer of butanal?
    a) 2-Butanone b) 2-Methyl propanal c) 2-Butanol d) But-2-en-1-ol
33. The decreasing order of – I effect of the following is:
    I. $R_4N^{\oplus}$ II. NO_2 III. CN IV. SO_3H V. COOH
    a) I > *II* > *III* > *IV* > *V* b) II > *I* > *III* > *IV* > *V*
    c) I > *II* > *III* > *V* > *IV* d) II > *I* > *V* > *IV* > *III*
34. Which of the following statements is wrong for a homologus series?
    a) All members have a general formula
    b) All members have the same functional group
    c) All members have the same chemical properties
    d) All members have the same physical properties
35. Which of the following is a3° alcohol?
    a) *t*-Butyl carbinol b) 2-Methyl propan-2-ol c) 2-Methyl butan-1-ol d) Isoamyl alcohol
36. The IUPAC name of acrolein is:
    a) But-2-enal b) Prop-2-enal c) But-3-enal d) 2-Methyl prop-2-enal
37. 7.5 ml of agaseous hydrocarbon was exploded with 36 ml of O_2. On cooling, the volume of gases was found to be 28.5 ml, 15 ml of which was absorbed by KOH and the rest was absorbed in the solution of alkaline pyrogallol. The formula of hydrocarbon is:
    a) C_2H_6 b) C_2H_4 c) C_3H_8 d) C_3H_6
38. The total number of conformations of ethane is:
    a) Infinite b) Two c) Three d) Four
39. The dihedral angle between the hydrogen atoms of two methyl groups in staggered confirmation of ethane is:
    a) 120° b) 180° c) 90° d) 60°
40. The correct IUPAC name of the compound is:



    a) 5,6-Diethyl-3-methyl dec-4-ene b) 5,6-Diethyl-8-methyl dec-6-ene
    c) 6-Butyl-5-ethyl-3-methyl oct-4-ene d) 2,4,5-Triethyl-3-nonene
41. Give the IUPAC name of:



    a) 2,2-Dimethyl-3-propyl-4-isopropyl heptane b) 4-Isopropyl-5-*t*-butyl octane

c) 4-t-Butyl-5-isopropyl octane d) 2-Methyl-3-propyl-4-isopropyl heptane

42. Propane $\xrightarrow[h\nu]{Cl_2}$ N(Isomeric products)

$C_3H_6Cl_2$ ↓ Fractional distillation ↓ M (Isomeric products)

What are the numerical values of N and M?

a) 6,6 b) 5,4 c) 4,4 d) 3,3

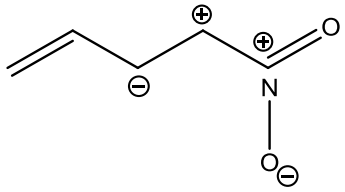
43. The number of σ- and π-bonds in hexane-2,4-diol respectively, is:

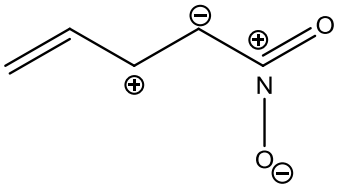
a) 18,2 b) 17,2 c) 17,1 d) 18,2

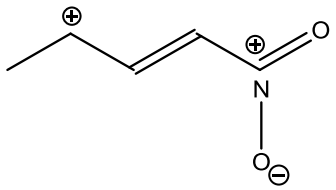
44. The number of isomers that can be obtained theoretically on monochlorination of 2-methylbutane is:

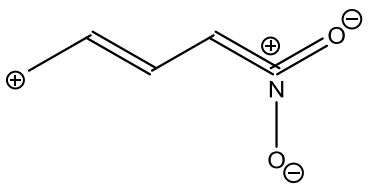
a) 1 b) 2 c) 3 d) 4

45. Among the following the least stable resonance structure is

a) 

b) 

c) 

d) 

46. Which of the following compounds exhibits stereoisomerism?

a) 2-Methylbutene b) 3-Methylbutyne c) 3-Methylbutanoic acid d) 2-Methylbutanoic acid

47. A mixture of ethylene and excess of H_2had a pressure of 600 mm Hg. The mixture was passed over nickel catalyst to convert ethylene to ethane. The pressure of the resultant mixture at the similar conditions of temperature and volume dropped to 400 mm Hg. The fraction of C_2H_4 by volume in the original mixture is:

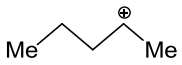
a) 1/3rd of the total volume b) 1/4th of the total volume

c) 2/3rd of the total volume d) 1/2 of the total volume

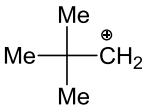
48. In Liebig's method for the estimation of C and H, if the compound also contains N, which of the following is kept near the exit of the combustion tube?

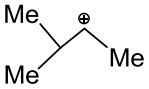
a) Silver wire b) $PbCrO_4$ c) Both (a) and (b) d) Cu gauge

49. Which of the following carbocations is most stable?

a) 

b) 

c) 

d) 

50. The hybridisation of C atoms in $(C-C)$ single-bond of $H-C\equiv C-CH\equiv CH_2$ is:

a) sp^3-sp^3 b) sp^2-sp^3 c) $sp-sp^2$ d) sp^3-sp

51. Which of the following statements is correct?

a) The presence of chiral carbon is essential condition for enantiomerism

b) Functional isomerism is a kind of stereoisomerism

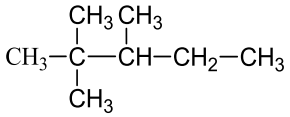
c) The compounds containing one chiral carbon only are always chiral

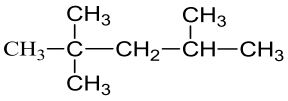
d) All statements are wrong

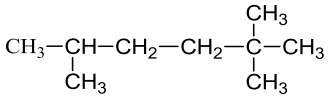
52. Polarisation of electrons in acrolein may be written as:

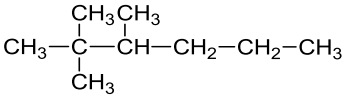
a) $\overset{-\delta}{C}H_2=CH-\overset{+\delta}{C}=O$ b) $\overset{-\delta}{C}H_2=CH-CH=\overset{+\delta}{O}$ c) $\overset{-\delta}{C}H_2=\overset{+\delta}{C}-CH=O$ d) $\overset{+\delta}{C}H_2=CH-CH=\overset{-\delta}{O}$

53. Which compound is 2,2,3-trimethyl hexane?

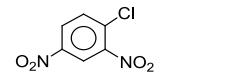
a) 

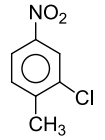
b) 

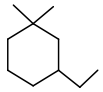
c) 

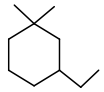
d) 

54. Which of the following is correctly named?

a) 
(4-Chloro-1, 3-dinitro benzene)

b) 
4-Methyl-5-chloro-nitro benzene

c) 
3-Ethyl-1, 1-dimethyl cyclo hexane

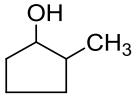
d) 
1-Ethyl-3, 3-dimethyl cyclohexane

55. How many optically active stereoisomers are possible for butane-2-3-diol?
a) 1 b) 2 c) 3 d) 4

56. The total number of halogenated products likely to be formed by the ethane is:
a) 4 b) 6 c) 9 d) 8

57. The IUPAC name of $(CH_3)_3C-CH=CH_2$ is:
a) 2,2-Dimethyl but-3-ene b) 2,2-Dimethyl pent-4-ene
c) 3,3-Dimethyl but-1-ene d) Hex-1-ene

58. Nine volumes of gaseous mixture consisting of gaseous organic compound A and just sufficient amount of oxygen required for complete combustion yielded on burning four volumes of CO_2,six volumes of water vapour, and two volumes of N_2, all volumes measured at the same temperature and pressure. If the compound contains C, H, and N only, the molecular formula of the compound A is:
a) $C_2H_3N_2$ b) $C_2H_6N_2$ c) $C_3H_6N_2$ d) C_3H_6N

59. Which of the following structures represents cyclopentyl methyl carbinol?
a)  b)  c)  d) 

60. Hyperconjugation involves overlap of the following orbitals
a) σ- σ b) $\sigma-\rho$ c) $p-p$ d) $\pi-\pi$

61. The weight of 1 litre of ozonised oxygen at STP was found to be 1.5 gm. When 100 ml of this mixture at STP was treated with turpentine oil, the volume was reduced to90 ml.The molecular weight of ozone is:
a) 49 b) 47 c) 46 d) 47.9

62. The decreasing basic character of the following is:
I.$PhO^{\ominus}$ II.$CH_3S^{\ominus}$ III.$\overset{\ominus}{O}H$ IV.$MeO^{\ominus}$
a) I > *II* > *III* > *IV* b) III > *IV* > *II* > *I* c) IV > *III* > *II* > *I* d) I > *II* > *IV* > *III*

63. Predict the number of stereoisomers in $CH_2OH.(CHOH_4).CHO$
a) 16 b) 8 c) 4 d) 2

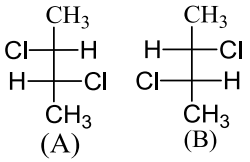
64. The decreasing order of the acidic characters of the following is:
I.$CH\equiv CH$ II.  III. 
a) I > *II* > *III* b) II > *I* > *III* c) III > *II* > *I* d) I > *III* > *II*

65. The decreasing order of basic characters of the following is:
I. Aniline II. *o*-Nitroaniline
III.*m*-NitroanilineIV. *p*-Nitroaniline
a) I > *II* > *III* > *IV* b) IV > *III* > *I*I > *I* c) I > *III* > IV > II d) I > *III* > *II* > IV

66. Predict the number of stereoisomers for 2,5-heptadiene
a) 4 b) 3 c) 2 d) 5

67. The bond between carbon atom (1) and carbon atom (2) in the compound $N\equiv C-CH=CH_2$ involves the hybridisation as:
a) sp^2 and sp^2 b) sp^3 and sp c) sp and sp^2 d) sp and sp

68. If optical rotation produced by the compound (A) is +52°, the one produced by compound (B) is:



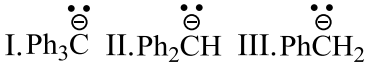
(A) (B)

a) −52° b) +52° c) 0° d) Unpredictable

69. In Liebig's method for the estimation of C and H, if the compound also contains both halogens and S, which of the following is kept near theexit of the combustion tube?

a) Silver wire b) $PbCrO_4$ c) Both (a) and (b) d) Cu gauge

70. The decreasing order of stabilities of the following carbanions is:

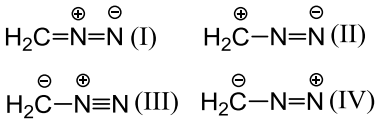


a) I > II > III b) II > I > III c) III > II > I d) III > I > II

71. The empirical formula of a compound is CH_2O and its vapour density is 30. The molecular formula of the compound is:

a) $C_3H_6O_3$ b) $C_2H_4O_2$ c) CH_2O d) C_2H_4O

72. The correct order of stabilities of the following resonance structures is:

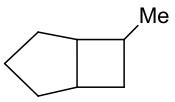


a) I > *II* > *IV* > *III* b) I > *III* > *II* > *IV* c) II > *I* > *III* > *IV* d) III > *I* > *IV* > *II*

73. Six hundred millilitres of ozonised oxygen at STP was found to weigh 1 gm. What is the volume of ozone in the ozonised oxygen?

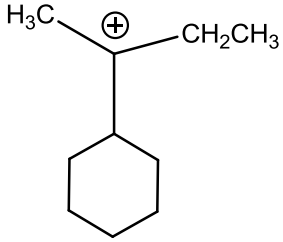
a) 200 ml b) 150 ml c) 100 ml d) 50 ml

74. The systematic naming of the following cycloalkane is:



a) 6-Methyl bicyclo [3.2.0] heptane b) 7-Methyl bicyclo [3.2.0] heptane
c) 2-Methyl bicyclo [3.2.0] heptane d) 3-Methyl bicyclo [3.2.0] heptane

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



a) Three b) Five c) Eight d) Six

76. The number of 1°, 2°, and 3° H atoms in 3-ethyl-5-methyl heptane, respectively, is:

a) 12,8,1 b) 14,4,2 c) 12,6,2 d) 12,8,2

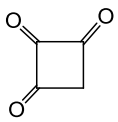
77. 2-hexyne gives *trans*-2-hexene on treatment with

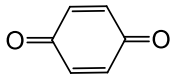
a) Li/NH_3 b) $Pd/BaSO_4$ c) $LiAlH_4$ d) Pt/H_2

78. The concentration of C = 85.45% and H = 14.55% is not obeyed by the formula:

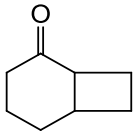
a) C_4H_8 b) C_2H_4 c) C_2H_6 d) CH_2

79. Tautomerism is not exhibited by:

a) 

b) 

c) 

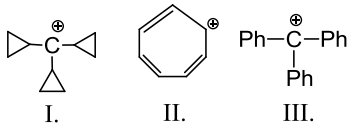
d) 

80. The alkane which has only 1° H atoms is:
a) Neopentane b) Isopentane c) Pentane d) 2,2-Dimethyl butane

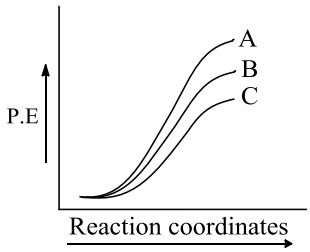
81. Which of the following statements regarding the concept of resonance is not correct?
a) The different resonating structures of a molecule have fixed arrangement of atomic nuclei
b) The different resonating structures differ in the arrangement of electrons
c) None of the individual resonating structures explains the various characteristics of the molecule
d) The hybrid structures have equal contribution from all the resonating structures

82. Which of the following compounds will exhibit geometrical isomerism?
a) 1-Phenyl-2-butene b) 3-Phenyl-1-butene
c) 2-Phenyl-1-butene d) 1,1-Diphenyl-1-propene

83. In the following graph, stability of different carbocations have been shown:



I. II. III.

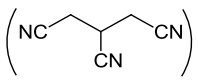


Match the potential energy curve with carbocation
I II III
a) A B C b) B A C
c) C B A d) C A B

84. The smallest aldehyde and its next homologue are treated with NH_2OH to form oxime. Find out the correct answer out of the following
a) Two different oximes are formed b) Three different oximes are formed
c) Two oximes are optically active d) All oximes are optically active

85. The IUPAC name of the compound with formula C_nH_{2n+2}, having the lowest possible molecular mass and capable of showing enantiomerism, is:
a) 3-Methyl hexane b) 2,3-Dimethyl pentane c) Methane d) Both (a) and (b)

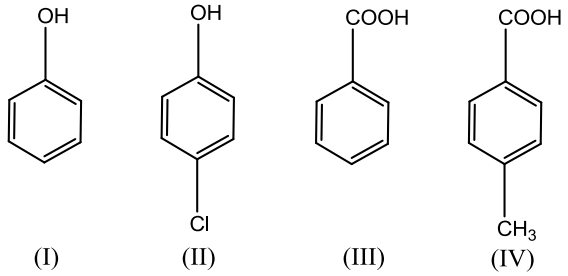
86. The IUPAC name of the following compound is:



a) Propane-1,2,3-tricarbonitrile b) 3-Cyanopetane-1,5-dinitrile
c) Pentane-1,3,5-trinitrile d) All

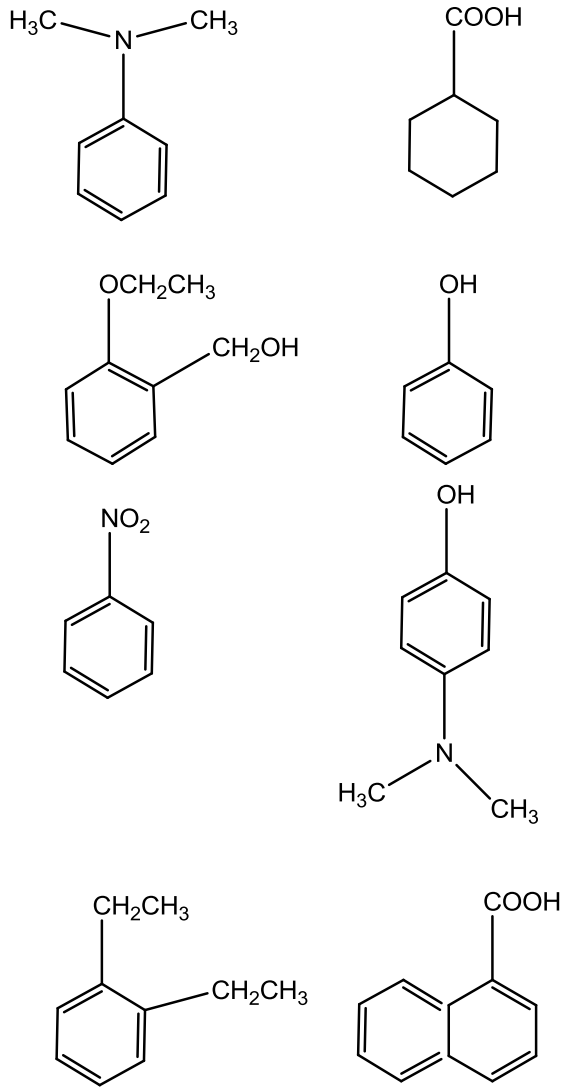
87. The optically active tartaric acid is named as D-(+)-tartaric acid because it has apositive
a) Optical rotation and its derived from D-glucose
b) pH in organic solvent
c) Optical rotation and is derived form D-(+)-glyceraldehyde
d) Optical rotation when substituted by deuterium

88. Which of the following compounds has isopropyl group?
    a) 2,2,3,3-Tetramethyl pentane
    b) 2,2-Dimethyl pentane
    c) 2,2,3-Trimethyl pentane
    d) 2-methyl pentane
89. The type of isomerism exhibited by the compound with formula $C_4H_{10}O$ is:
    a) Chain and position
    b) Functional and position
    c) Metamerism
    d) Chain, position, functional, and metamerism
90. Lassigne's test is used for the detection of:
    a) N, S, and halogens
    b) C, H, and P
    c) C, H, and O
    d) C, S, and P
91. The correct acidity order of the following is

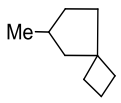


(I) (II) (III) (IV)

    a) (III)>(IV)>(II)>(I)
    b) (IV)>(III)>(I)>(II)
    c) (III)>(II)>(I)>(IV)
    d) (II)>(III)>(IV)>(I)
92. Amongst the following, the total number of compounds soluble in aqueous NaOH is



    a) 1
    b) 2
    c) 3
    d) 4
93. The systematic momenclature of the following spiro-compound is:



a) 2-Methyl spiro [3.4] octane
b) 3-Methyl spiro [3.4] octane
c) 6-Methyl spiro [3.4] octane
d) 7-Methyl spiro [3.4] octane

94. Racemic acid + optically active alcohol having chiral C atom →?
The product will be:
a) Optically active mixture
b) Meso compound
c) Diastereomeric mixture
d) Racemic mixture

95. The degree of unsaturation or index of hydrogen deficiency in the following is:
i. C_6H_{14} ii. C_4H_6 iii. C_6H_6
a) 0, 2, 4
b) 1, 0, 2
c) 4, 1, 0
d) 2, 0, 4

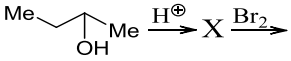
96. The enolic form of acetone contains:
a) 9 σ-bonds, 1 π-bond, and 2 lone pairs
b) 8 σ-bonds, 2 π-bonds, and 2 lone pairs
c) 10 σ-bonds, 2 π-bonds, and 1 lone pair
d) 9 σ-bonds, 2 π-bonds, and 2 lone pairs

97. Which of the following has only 1° and 2° C atoms?
a) 2-Methyl butane
b) Butane
c) 2,2-Dimethyl butane
d) 2,2,3,3-Tetramethyl pentane

98. With a change in hybridisation of the carbon bearing the charge, the stability of a carbanion increase in the order
a) $sp < sp^2 < sp^3$
b) $sp < sp^3 < sp^2$
c) $sp^3 < sp^2 < sp$
d) $sp^2 < sp < sp^3$

99. In Dumas method for the estimation of nitrogen in an organic compound, nitrogen is determined in the form of:
a) Gaseous nitrogen
b) Sodium cyanide
c) Ammonium sulphate
d) Gaseous ammonia

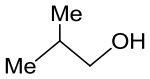
100. Which of the following will have the least hindered rotation about carbon-carbon bond?
a) Ethane
b) Ethylene
c) Acetylene
d) Hexachloroethane

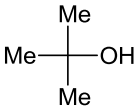
101. 

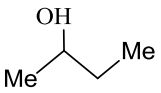
Five compounds with formula $C_4H_8Br_2$
How many structures of (X) are possible?
a) 2
b) 3
c) 4
d) 5

102. The keto form of phenol contains:
a) 3π, 13 σ, 4 non-bonding electrons
b) 3π, 9 σ, 4 non-bonding electrons
c) 3π, 9 σ, 2 non-bonding electrons
d) 3π, 8 σ, 4 non-bonding electrons

103. The compound which would give the most stable carbocation on dehydration is:
a) 

b) 

c) 

d) 

104. Which of one following is a3° amine?
a) Propan-2-amine
b) *N*-Methyl ethanamine
c) Allyl amine
d) *N*, *N*-Diethyl butan-1-amine

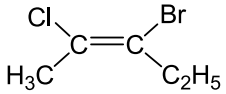
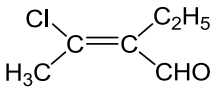
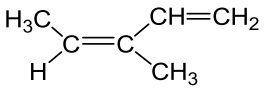
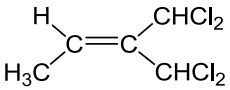
105. If a compound has n asymmetric carbon atoms with different terminal groups, the number of stereoisomers is given by the formula:
a) $(1/2)^n$
b) 2^ns
c) $2\sqrt{n}$
d) $\sqrt{2}\,n$

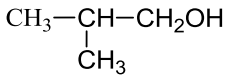
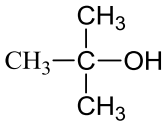
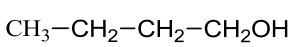
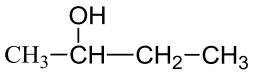
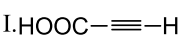
106. Ten millilitre of a gaseous hydrocarbon was burnt completely in 80 ml of O_2at STP. The volume of the remaining gas is 70 ml. The volume become 50 ml on treatment with NaOH. The formula of the hydrocarbon is:
a) C_2H_6
b) C_2H_4
c) C_3H_8
d) C_3H_6

107. The number of geometrical isomers in $CH_3CH = N - OH$ is:
a) 2
b) 4
c) 5
d) 6

108. How many chiral carbons are present in glucose molecule $CHO(CHOH)_4CH_2OH$?
a) 4
b) 3
c) 2
d) 1

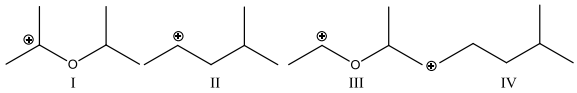
109. The *E*-isomer among the following is:

a)  b)  c)  d) 

110. Mesotartaric acid is optically inactive due to the presence of:
    a) Geometrical isomerism b) Two chiral carbon atoms
    c) Molecular symmetry d) External compensation
111. A compound contains 38.8%C, 16%H, and 45.2%N. The formula of the compound would be:
    a) CH_3NH_2 b) C_2H_5CN c) CH_3CN d) $CH_2(NH_2)_2$
112. Which of the following objects is chiral?
    a) Nail b) Blade c) Tennis racket d) Laced football
113. The number of 1°, 2°, and 3° H atoms in 2,5,6-trimethyl octane, respectively, is
    a) 16,5,3 b) 15,6,3 c) 16,6,3 d) 15,5,2
114. The decreasing order of priority for the following functional group is:
    I.$-COOH$**II.**$-SO_3H$**III.**$-COOR$**IV.**$-COCl$
    a) (IV)> (III)>(II)>(I) b) (I)> (II)>(III)>(IV) c) (II)> (I)>(III)>(IV) d) (IV)> (III)>(I)>(II)
115. The decreasing order of the acidic characters of the following is:
    I. p-Nitrophenol II. o-Nitrophenol
    III. m-NitrophenolIV. Phenol
    a) I > $II > III > IV$ b) II > $I > III > IV$ c) I > $II > IV > III$ d) II > $I > IV > III$
116. Which of the following will have zero dipole moment?
    a) cis-1,2-Dichloroethene b) $trans$-1,2-Dichloroethene
    c) Dichloromethane d) o-Phenylene dichloride
117. The compound in which the distance between the two adjacent carbon atoms is largest is:
    a) Ethane b) Ethene c) Ethyne d) Benzene
118. An organic compound containing sulphur is estimated by Carius method in which fuming $HNO_3$is used to convert S into:
    a) SO_3^{2-} b) SO_4^{2-} c) SO_3 d) SO_2
119. Which of the following is the least stable form of the cyclohaxane?
    a) Boat form b) Chair form c) Skew-boat form d) Crown form
120. The compound that gives the most stable carbonium ion on dehydration is:
    a)  b) 
    c)  d) 
121. A hydrocarbon with formula C_8H_{18} gives one monochloro derivative. The hydrocarbon can be:
    a) n-Octane b) 2-Methyl heptane
    c) 2,2, 4-Trimethyl butane d) 2,2,3,3-Tetramethyl butane
122. The decreasing order of the acidic character is:
    I.  II.  III. 
    a) I > $II > III$ b) III > $II > I$ c) II > $I > III$ d) III > $I > II$
123. The isomers that can be interconverted through rotation around a single bond are:
    a) Conformers b) Diastereoisomers c) Enantiomers d) Positional isomers
124. Which among the following is likely to show geometrical isomerism?
    a) $CH_3CH = CH_2$ b) $CH_3CH = N - OH$
    c) $CH_3C(Cl) = C(CH_3)_2$ d) $CH_2 = CH - CH = CCl_2$
125. The number of stereoisomers obtained by bromination of $trans - 2 -$butene is?
    a) 1 b) 2 c) 3 d) 4
126. The degree of unsaturation in
    i. $C_3H_3Cl_3$ ii. C_3H_4O, and iii. C_4H_5N is:

a) 2, 1, 3 b) 1, 2, 3 c) 3, 2, 1 d) 2, 3, 1

127. The correct stability order for the following species as



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

128. Among the following compounds, the most acidic is

a) *p*-nitrophenol b) *p*-hydroxybenzoic acid

c) *o*-hydroxybenzoic acid d) *p*-toluic acid

129. The decreasing order of boiling points of the following is:

I. RCOCl II. $(RCO)_2O$

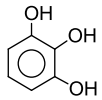
III. $RCONH_2$ IV. RCOOH

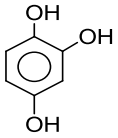
a) I > *IV* > *II* > *III* b) III > *II* > *IV* > *I* c) IV > *III* > *I* > *II* d) II > *I* > *III* > *IV*

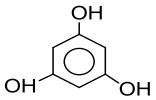
130. Acids and esters having the same number of carbon atoms are:

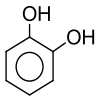
a) Functional isomers b) Tautomers c) Metamers d) Not isomers

131. Which of the following is pyrogallol?

a) 

b) 

c) 

d) 

132. The least energetic conformation of cyclohexane is:

a) Boat form b) Half chair form c) Chair form d) Twisted form

133. The decreasing order of +I effect of the following is:

I. $-O^{\ominus}$ II. Me − III. Et − IV. Me_2CH − V. Me_3C −

a) I > *II* > *III* > *IV* > *V* b) V > *IV* > *III* > *II* > *I*

c) I > *V* > *IV* > *III* > *II* d) II > *III* > *IV* > *V* > *I*

134. $PhCH_2CH(Br)Ph \xrightarrow{Alc.KOH}$ Product

How many products are possible?

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

135. A racemic mixture is optically inactive due to:

a) The presence of plane of symmetry b) External compensation

c) Internal compensation d) None of these

136. The total number of acyclic isomers, including the stereoisomers, with formula C_4H_7Cl is:

a) 12 b) 11 c) 10 d) 9

137. The IUPAC name of PhCN is:

a) Phenyl cyanide b) Benzonitrile c) Benzene nitrile d) All

138. The two compounds have the same empirical formula but different molecular formula, they must have:

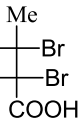
a) Different percentage composition b) Different molecular weights

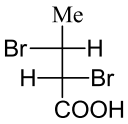
c) Same velocity d) Same vapour density

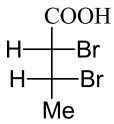
139. 0.5 gm of an organic substance containing phosphorous was heated with conc. HNO_3 in the Carius tube. The phosphoric acid thus formed was precipitated with magnesia mixture($MgNH_4PO_4$) which on ignition gave a residue of 1.0 gm of magnesium pyrophosphate($Mg_2P_2O_7$). The percentage of phosphorous in the organic compound is:

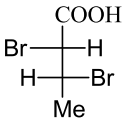
a) 55.85% b) 29.72% c) 19.18% d) 20.5%

140. Which of the following are diastereomers?

i. 
(I)

ii. 
(II)

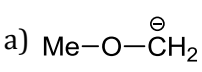
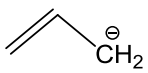
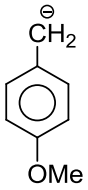
iii. 
(III)

iv. 
(IV)

a) (I) and (III) b) (II) and (IV) c) (I) and (II) d) None

141. A compound (60 gm) on analysis gave C = 24 gm, H = 4 gm, and O = 32 gm. Its empirical formula is:
a) C_2H_2O b) $C_2H_4O_2$ c) CH_2O d) CH_2O_2

142. Arrange the following in the increasing order of expected enol content
i. CH_3COCH_2CHO
ii. CH_3COCH_3
iii. CH_3CHO
iv. $CH_3COCH_2COCH_3$
a) iii $< i < ii < iv$ b) iii $< ii < i < iv$ c) i $< iv < ii < iii$ d) iv $< i <$ ii $< iii$

143. Which of the following is least stable?
a)  b)  c) $PhCH_2^{\ominus}$ d) 

144. Liquid benzene (C_6H_6) burns in oxygen according to
$2C_6H_6(l) + 15O_2(g) \rightarrow 12CO_2(g) + 6H_2O(g)$
How many litres of O_2 at STP are needed for complete combustion of 39 gm of liquid benzene?
a) 11.2 litres b) 74 litres c) 84 litres d) 22.4 litres

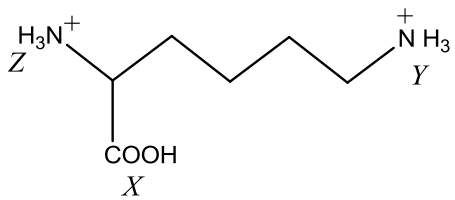
145. An SN^2 reaction at an asymmetric C of a compound always gives:
a) An enantiomer of the substrate b) A product with opposite optical rotation
c) A mixture of diastereomers d) A single stereoisomer

146. The number of isomers of the compound $C_2FClBrI$ is:
a) 3 b) 4 c) 5 d) 6

147. In Liebig's method for the estimation of C and H, if the compound also contains halogens, which of the following is kept near the exit of the combustion tube?
a) Silver wire b) $PbCrO_4$ c) Both (a) and (b) d) Cu gauge

148. The empirical formula of an organic compound is CH_2. The mass of 1 mol of it is 42 gm. The molecular formula of the compound is:
a) C_4H_8 b) C_2H_4 c) C_3H_6 d) CH_2

149. Which of the following compounds will exhibit *cis-trans*(geometrical) isomerism?
a) 2-Butene b) 2-Butyne c) 2-Butanol d) Butanal

150. Arrange in order of increasing acidic strength.

a) X>Z>Y b) Z<X>Y c) X>Y>Z d) Z>X>Y

151. An isomer of ethanol is:
a) Methanol b) Diethyl ether c) Acetone d) Dimethyl ether

152. Which of the following species is most stable?

a) $CH_2{=}\dot{C}H$ b) $Ph\dot{C}H_2$ c) $Me_3\dot{C}$ d) $Me_2\dot{C}H$

153. The number of isomers for the compound with molecular formula $C_2BrClFI$ is:
a) 3 b) 4 c) 5 d) 6

154. 0.24 gm of a volatile liquid upon vaporisation gives 45 ml of vapours at STP. What will be the vapour density of the substance? (Density of $H_2 = 0.089$ gm litre^{-1})
a) 9.539 b) 59.93 c) 5.993 d) 95.39

155. 0.3 gm of platinichloride of an organic diacidic base left 0.09 gm of platinum on ignition. The molecular weight of the organic base is:
a) 120 b) 240 c) 180 d) 60

156. The compound which is not isomeric with diethyl ether is:
a) n-Propyl methyl ether b) Butan-1-ol c) 2-Methyl propan-2-ol d) Butanone

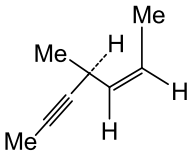
157. Symbol D stands for:
a) Dextrorotatory, which rotates P.P.L. towards right
b) Dextrorotatory, which rotates P.P.L. towards left
c) Relative configuration with respect to lactic acid taken as standard
d) Relative configuration with respect to glyceraldehyde taken as standard and (OH) group is on the right side

158. Which of the following is a soft base?
a) NH_3 b) R_2S c) Cu^+ d) H_2O

159. The total number of cyclic isomers possible for a hydrocarbon with the molecular formula C_4H_6 is
a) 1 b) 3 c) 5 d) 7

160. The decreasing nucleophilicity of the following is:
I. $CH_3S^{\ominus}$ II. $CH_3O^{\ominus}$ III. $\overset{\ominus}{O}H$ IV. $EtO^{\ominus}$
a) IV > *III* > *II* > *I* b) I > *II* > *III* > *IV* c) IV > *III* > *I* > *II* d) II > *I* > *III* > *IV*

161. The nodal plane in the π-bond of ethane is located in:
a) The molecular plane
b) A plane parallel to the molecular plane
c) A plane perpendicular to the molecular plane which bisects the carbon-carbon σ-bond at right angle
d) A plane perpendicular to the molecular plane which contains the carbon-carbon σ-bond

162. 

Hydrogenation of the above compound in the presence of poisoned Pd catalyst gives:
a) An optically active compound b) An optically inactive compound
c) A racemic mixture d) A diastereomeric mixture

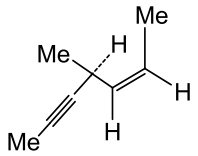
163. Pure enantiomericacid+optically active alcohol having chiral C atom →?
The product will be:
a) An optically active compound b) A meso compound
c) A racemic mixture d) A pure enantiomer

164. Insulin contains 3.4% sulphur. The minimum molecular mass of an insulin is:
a) 940 b) 350 c) 470 d) 560

165. The increasing order of pK_b value of the following is:
I. $HC{\equiv}C^{\ominus}$ II. $H^{\ominus}$ III. $\overset{\ominus}{N}H_2$ IV. $\overset{\ominus}{C}H_3$
a) IV < *III* < *II* < *I* b) I < *II* < *III* < *IV* c) IV < *II* < *III* < *I* d) I < *III* < *II* < *IV*

166. The decreasing order of priority for the following functional groups is:
I. $-C \equiv N$ II. $-CONH_2$ III.  IV. $-CHO$
a) (II)> (I)>(IV)>(III) b) (III)> (IV)>(I)>(II) c) (I)> (II)>(IV)>(III) d) (I)> (II)>(III)>(IV)

167. Hydrogenation of the compound



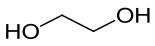
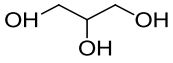
by Birch reduction ($Na + liq.\ NH_3 + C_2H_5OH$) gives:

a) An optically active compound
b) An optically inactive compound
c) A racemic mixture
d) A diastereomeric mixture

168. The enolic form of acetone contains:

a) 9 σ-bonds, 1 π-bond, and 2 lone pairs
b) 8 σ-bonds, 2 π-bond, and 2 lone pairs
c) 10 σ-bonds, 1 π-bond, and 1 lone pair
d) 9 σ-bonds, 2 π-bonds, and 1 lone pair

169. Which of the following is zerone?

a) MeOH b)  c)  d) EtOH

170. A compound whose molecule is superimposable on its mirror image despite containing chiral carbon atoms is called:

a) Threo isomer b) Meso compound c) Enantiomer d) No special name

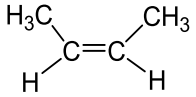
171. Which group is always taken as a substituent in the IUPAC system of nomenclature?

a) $-NO_2$ b) $-C \equiv N$ c)  d) $-NH_2$

172. In 2-Chloro-3-methyl hexanoic acid, the primary suffix is:

a) 2-Chloro- b) -3-Methyl c) an(e) d) oic acid

173. Which of the following hydrocarbons has the lowest dipole moment?

a)  b) $CH_3C \equiv CCH_3$ c) $CH_3CH_2C \equiv CH$ d) $CH_2 = CH - C \equiv CH$

174. In organic layer test, CS_2 or CCl_4 is added to Lassaigne's extract and then Cl_2 water or $KMnO_4$ is added. This test is used to distinguish between

a) $Br^{\ominus}$ and$I^{\ominus}$ b) $Cl^{\ominus}$ and$Br^{\ominus}$ c) $Cl^{\ominus}$ and $I^{\ominus}$ d) $Cl^{\ominus}$, $Br^{\ominus}$ and $I^{\ominus}$

175. Which of the following sodium compound is/are formed when an organic compound containing both nitrogen and sulphur is fused with sodium?

a) Sulphite and cyanide b) Thiocyanate c) Cyanide and Sulphide d) Nitrate and Sulphide

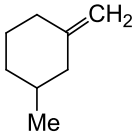
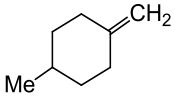
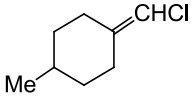
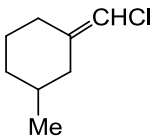
176. Which of the following is not a cumulated diene?

a) Hexa-1,2-diene b) Hexa-2,3-diene c) Penta-2,3-diene d) Penta-1,3-diene

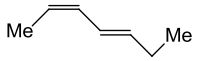
177. The Prussian blue colour obtained during the test of nitrogen by Lassaigne's test is due to the formation of:

a) $Fe_4[Fe(CN)_6]_3$ b) $Fe_2[Fe(CN)_6]$ c) $Fe_3[Fe(CN)_6]_4$ d) $Na_4[Fe(CN)_6]$

178. The geometrical isomerism is shown by:

a)  b)  c)  d) 

179. The correct name of the compound (I) is:



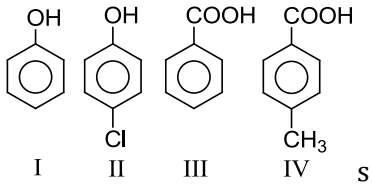
a) (E-2), (E-4), Hepta-2,4-diene b) (Z-2), (Z-4), Hepta-2,4-diene
c) (E-2), (Z-4), Hepta-2,4-diene d) (Z-2), (E-4), Hepta-2,4-diene

180. The catalyst used in Kjeldahl's method for the estimation of nitrogen is:

a) Copper b) Magnesium c) Mercury d) Sodium

181. 0.14 gm of an acid required 12.5 ml of 0.1 N NaOH for complete neturalisation. The equivalent mass of the acid is:
a) 63 b) 56 c) 45 d) 112

182. The correct order of acidities of the following is:



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

183. The decreasing order of priority for the following functional groups is:

I.$-OH$ **II.** $-C \equiv C-$ **III.** $>C=C<$ **IV.** $-NH_2$

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

184. A compound which does not give a positive test in Lassaigne's test for nitrogen is:
a) Glycine b) Hydrazine c) Urea d) Phenyl hydrazine

185. Which of the following alkenes is most stable?
a) $(CH_3)_2CH = CH_2$ b) $CH_3CH = CHCH_3$ c) $(CH_3)_2C = C(CH_3)_2$ d) $CH_3CH = CH_2$

186. The molecular mass of a compound having empirical formula C_2H_5O is 90.The molecular formula of the compound is:
a) $C_6H_{15}O_3$ b) $C_4H_{10}O_2$ c) C_2H_5O d) $C_3H_6O_3$

187. How many gem dihalides with different formulas are possible for$C_3H_6CI_2$?
a) 1 b) 2 c) 3 d) 4

188. *n*-Butane (C_4H_{10}) is produced by monobromination of C_2H_6 followed by Wurtz reaction. Calculate the volume of ethane at S.T.P. required to produce 55 gm of *n*-butane. The bromination takes place with 90% yield and the Wurtz reaction with 85% yield
a) 27.75 litres b) 55.5 litres c) 111 litres d) 5.55 litres

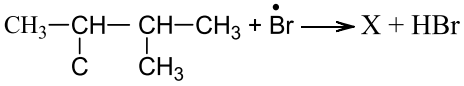
189. The number of σ- and π-bonds in 1-buten-3-yne is:
a) 5 σ and 5 π b) 7 σ and 3 π c) 8 σ and 2 π d) 6 σ and 4 π

190. Which of the following kinds of isomerism can nitroethane exhibit?
a) Metamerism b) Optical activity c) Tautomerism d) Position isomerism

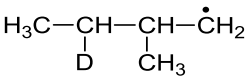
191. Which of the following will not be able to show optical isomerism (enantiomerism)?
a) 1, 2-Propadiene b) 2,3-Pentadiene
c) *sec*-Butyl alcohol d) All exhibit enantiomerism

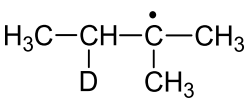
192. The most strained cycloalkane is:
a) Cyclopropane b) Cyclobutane c) Cyclopentane d) Cyclohexane

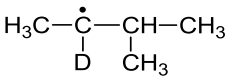
193. Consider the following reaction:

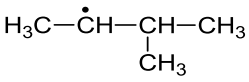


Identify the structure of the major product 'X'.

a) 

b) 

c) 

d) 

194. In which of the following compounds, nitrogen cannot be tested by Lassaigne's test?
a) CH_3CONH_2 b) $NH_2 \cdot NH_2 \cdot H_2O$ c) $C_6H_5NH_2$ d) $C_6H_5NO_2$

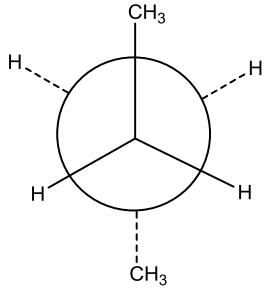
195. In the estimation of nitrogen by Kjeldahl's method,2.8 gm of an organic compound required 20 millimole ofH_2SO_4 for the complete neutralisation of NH_3gas evolved. The percentage of nitrogen in the sample is:
a) 20% b) 10% c) 40% d) 30%

196. Hydride shift from C-2 will give the most stable resonance stabilized carbocation as
a) CH_3 at $C-4$ b) H at C – 4 c) CH_3 at $C-2$ d) H at C-2

197. Among the following, the compound that can be most readily sulphonated is:

a) Benzene b) Nitrobenzene c) Toluene d) Chlorobenzene

198. The IUPAC name of vinyl acetylene is:
a) Pent-1-en-4-yne b) Pent-4-yn-1-ene c) But-1-en-3-yne d) But-1-yn-3-ene

199. 

C_2 is rotated anticlockwise 102°C about $C_2 - C_3$ bond. The resulting conformer is
a) Partially eclipsed b) Eclipsed c) gauche d) Staggered

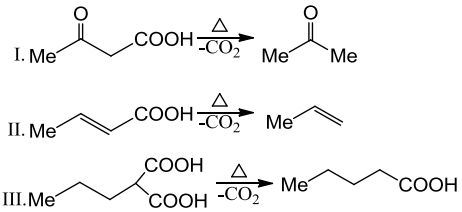
200. Which of the following is not the name of CH_3NC?
a) Methyl isocyanide b) Acetoisonitrile c) Methyl carbylamines d) Acetonitrile

201. A Compound containing 80%C and 20%H is likely to be:
a) C_3H_8 b) CH_4 c) C_6H_6 d) C_2H_6

202. A compound contains $C = 90\%$ and$H = 10\%$.Empirical formula of the compound is:
a) $C_{15}H_{30}$ b) $C_{15}H_{20}$ c) C_3H_4 d) C_3H_{10}

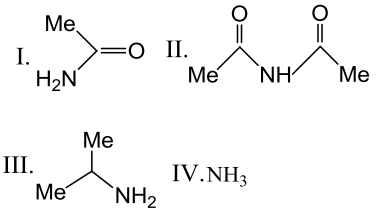
203. An organic compound contains $C = 40\%, O = 53.5\%$, and $H = 6.5\%$. The empirical formula of the compound is :
a) CH_2O b) C_2H_4O c) $C_6H_{12}O_6$ d) $C_2H_4O_2$

204. In which of the following reactions, the principal group loses its preferences?



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

205. Arrange the following is their decreasing order of acidity

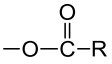


a) III > IV > I > II b) I > II > III> IV c) IV > III > II > I d) II > III > I > IV

Multiple Correct Answers Type

206. Which of the following statements regarding 1,2-dimethyl cyclo-pentane and 1,3-dimethyl cyclopentaneis/are correct?
a) In both *cis*form is meso, while *trans*form is resolvable
b) In both *trans* form is meso, while *cis* form is resolvable
c) In both, *cis*and *trans*forms are meso
d) In both, *cis*and *trans*forms are resolvable

207. Only two isomeric monochloro derivatives are possible for
a) *n*-Butane b) 2,4-Dimethyl pentane c) Benzene d) 2-Methyl propane

208. Which of the following group(s) is/are *o*- and *p*-directing?
a) $-CN$ b) $-SO_3H$ c) $-NH_2$ d) 

209. Which form(s) of cyclohexane is/are free from angle strain?

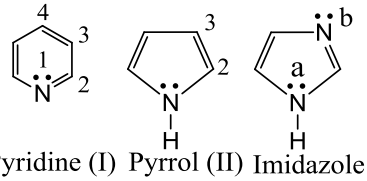
a) Chair form b) Boat Form c) Twist boat form d) All

210. Which of the following reactions is/are correct?

a) $C_xH_y + \left(x + \frac{y}{2}\right) O_2 \rightarrow x\ CO_2 + \frac{y}{2} H_2O$ b) $4\ Fe^{3+} + [Fe(CN_6)]^{4-} \rightarrow Fe_3[Fe(CN)_6]_4$

c) $5\ CO + I_2O_5 \rightarrow I_2 + 5\ CO_2$ d) $Pb^{2+} + S^{2-} \rightarrow PbS$

211.



Pyridine (I) Pyrrol (II) Imidazole (III)

Which one(s) is/are true?

a) (I) and (III) are modest Bronsted bases whereas (II) is not

b) In (III) N^a is more basic than N^b

c) When (II) is protonated in the presence of a strong acid, protonation occurs at C-2

d) All the nitrogen present in (I), (II), and (III) is sp^2 hybridised

212. The configuration of sugars is related to glyceraldehyde and that of amino acids is related to:

a) Serine b) Leusine c) Alanine d) Glycine

213. Which of the following statements regarding 1,2-dimethylcyclopropane (I) and 1,2-dimethyl cyclobutane (II) are wrong?

a) Both of them show three stereoisomers

b) The *cis*form of both is optically inactive (meso) and the *trans*form of both has a pair of enantiomers

c) The *cis* form of both has a pair of enantiomers and the*trans*form of both is optically inactive (meso)

d) The meso form of both is optically inactive due to the presence of the centre of symmetry

214. Which of the following statements is/are correct?

a) $pK_{a1}$of maleic acid is less than pK_{a1} of fumaric acid

b) $pK_{a2}$of maleic acid is greater than pK_{a2} of fumaric acid

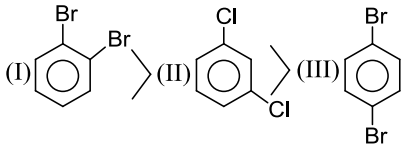
c) Phthalic acid is a stronger acid than isophthalic acid

d) Isophthalic acid is a stronger acid than terephthalic acid

215. Which of the following statements is correct?

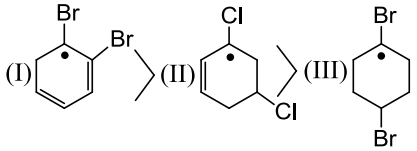
Dipole moment:

a)



Stability of free radical:

b)

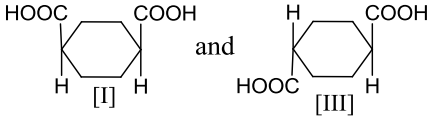


Basic strength:

c) $CH_3O^{\ominus} > \overset{\ominus}{O}H > RS^{\ominus}$

d) Basic and nucleophilic strength: $I^{\ominus} > Br^{\ominus} > Cl^{\ominus} > F^{\ominus}$

216. The compounds



are optically inactive because

a) Both compounds have the plane of symmetry

b) Both compounds have the centre of symmetry

c) Compound (I) has the plane of symmetry, while compound (II) has the centre of symmetry
d) Compound (I) has the centre of symmetry, while compound (II) has the plane of symmetry

217. Which of the following statements is/are wrong?
a) The gas displaced inVictor Meyer's method in air
b) The simplest formula that shows the ratio of the atoms of various elements present in the molecule is called the molecular formula
c) Estimation of oxygen in an organic compound is also made by Aluise's method
d) An organic monoacidic base B on reaction with H_2PtCl_6 forms an insoluble compound $B_2H_2PtCl_6$

218. Which of the following statements are correct?
a) A reaction in which different stereoisomers produce different products or act at different rates is called stereospecific reaction
b) A reaction in which a given substrate produces diastereoisomeric products in different amounts and where one diastereomer predominates very much over the other is called stereoselective reaction
c) If the replacement of one group at an achiral centre by a new substituent generates a chiral centre, the original molecule is said to be enantiotopic
d) The E and Zsystem of naming geometrical isomers is based on the CIP sequence rule

219. The compounds in which C uses its sp^3-hybride orbitals for bond formation are:
a) HCOOH b) $(H_2N)_2CO$ c) $(CH_3)_3COH$ d) CH_3CHO

220. Which of the following statements are correct?
a) Diastereomers have different physical properties and similar but not identical chemical properties
b) Enantiomers have the same physical and chemical properties but different physiological properties
c) Polarimeter is used in measuring the optical rotation of a compound
d) Only organic molecules show optical isomerism

221. Arrange the following in decreasing order of enol content:
i. Diethyl malonate
ii. Acetoaacetic ester (AAE or EAA)
iii. Acetyl Acetone
iv. $PhCOCH_2COCH_3$
a) (iv) > (iii) > (ii) > (i) b) (iv) > (iii) > (i) > (ii)
c) (iii) > (iv) > (ii) > (i) d) (iii) > (iv) > (i) > (ii)

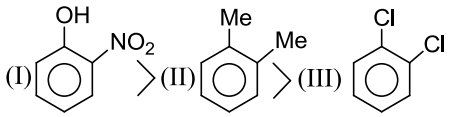
222. Which of the following statements is/are wrong?
a) Beilstein test is reliable test for halogens in organic compounds
b) In Lassaigne's test for N, Prussian blue colour is due to the formation of ferro-ferri cyanide
c) When $FeCl_3$solution is added to the Lassaigne's extract, ablue solution is obtained, which indicates the presence of both N and S
d) Molecular mass of an acid =Equivalent mass × acidity

223. Which of the following statements is/are correct?
a) When aLassaigne's solution is heated with dil.HNO_3,cooled, and $AgNO_3$solution is added, a yellow precipitate, partially soluble inNH_3or NH_4OH, indicates the presence of iodine in organic compound
b) When $(CH_3COO)_4Pb$ solution is added to the acidified Lassaigne's extract of an organic compound , a black precipitate of PbS is formed
c) An organic compound containing N, on heating with conc. H_2SO_4, gives $(NH_4)_2SO_4$which liberates NH_3on treatment with excess of NaOH
d) The molecular mass of a non-volatile organic compound is determined either by Dumas method or by Victor Meyer's method

224. Which of the following statements are wrong?
a) Ethyl benzene is the chain isomer of the xylene
b) Alkenes can exihibit the position, chain, functional, and geometrical isomerism
c) Esters and carboxylic acids are examples of metamerism
d) Metamers belong to different classes of compounds

225. Which of the following statements is/are correct?

Dipole moment of:

a) 

b) Dipole moment of: $CH_3F > CH_3Cl > CH_3Br > CH_3I$

c) Dipole moment of:$NH_3 > NF_3$

d) Dipole moment of:$CH_3Cl > CH_2Cl_2 > CHCl_3 > CCl_4$

226. Ketoenoltautomerism is not observed in:

a) Phenol b) Glycerol c) HCN d) Benzophenone

227. Which of the following statement is/are wrong?

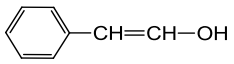
a) C_nH_{2n} in the general formula of alkanes

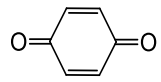
b) In homologous series, all members have the same physical properties

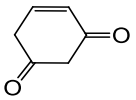
c) IUPAC means International Union of Physics and Chemistry

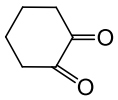
d) Butane contains two 1°C atoms and two 2°C atoms

228. Tautomerism is exhibited by:

a) 

b) 

c) 

d) 

229. Which of the following statements is/are correct?

a) The common name of benzene-1,2-diol is catechol

b) The common name of benzene-1,3-diol is resorcinol

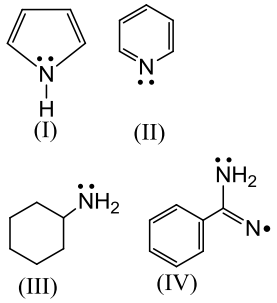
c) The common name of benzene-1,4-diol is quinol

d) The common name of benzene-1,4-diol is hydroquinone

230. The stable conformer(s) of *cis*-cyclohexane-1,3-diol is/are:

a) 1-axial-3-axial form b) 1-axial-3-equatorial form

c) 1-equatorial-3-axial form d) 1-equatorial-3-equatorial form

231. 

Which of the following statements is/are correct?

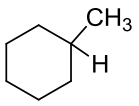
a) (I) and (II) are aromatic and have equal basic strength

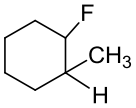
b) (I) is aromatic and (II) is anti-aromatic, but (II) is stronger base than (I)

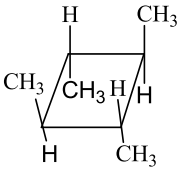
c) The order of basicity of the above compounds is (IV) > (III) > (II) > (I)

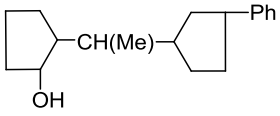
d) The conjugate acid of (IV) is more stabilized than the conjugate acid of (II)

232. Which of the following are resolvable?

a) 

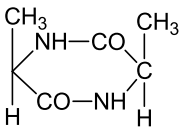
b) 

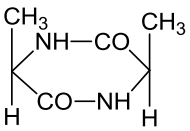
c) 

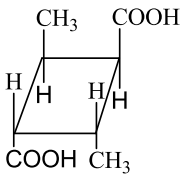
d) 

233. Which of the following are not resolvable?

a) 2,3-Pentadiene

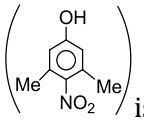
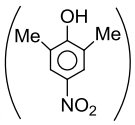
b) 

c) 

d) 

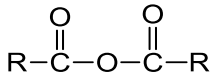
234. Which of the following is a hard acid?
a) Br_2 b) Cd^{2+} c) CO_2 d) Fe^{3+}

235. Which of the following statements are correct?
a) 2,3,4-Tribromo pentane has three chiral C atoms
b) Tartaric acid has two asymmetric C atoms
c) $d$and l forms of an optically active compounds have different specific rotations with opposite signs
d) Staggered and eclipsed forms of ethane have different stabilities

236. Which of the following statement(s) is/are correct?
a) 3,5-Dimethyl-4-nitrophenol (I)  is less acidic than the isomeric 2,6 –dimethyl-4-cynophenol (II) 
b) (I) is more acidic than (II)
c) (I) is less acidic than (II) due to steric inhibition of resonance of two (Me) groups with (NO_2) group
d) (I) is more acidic than (II) due to less +I effect of two (Me) groups in (I)

237. The angle strain in cyclohexane is:
a) $9°, 44'$ b) $0°, 44'$ c) $-5°, 16'$ d) $5°, 16'$

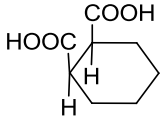
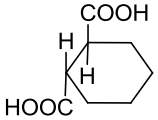
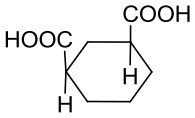
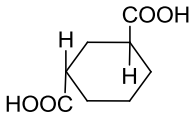
238. Which of the following compounds will show geometrical isomerism?
a) 2-Butene b) Propene c) 1-Phenyl propene d) 2-Methyl-2-butene

239. Which of the following statements is/are correct?
a)  is an unsaturated compound
b) Neohydrocarbons contain a 3°C atom
c) The IUPAC name of isopropyl alcohol is propan-2-ol
d) The IUPAC name of (CH_3CN) is ethanenitrile

240. Which of the following statements are true?
a) 2-Butanone on reaction with 2,4-DNP forms two compouns which are geometrical isomers and can be separated
b) Acetophenone on reaction with HCN forms two compounds which are geometrical isomers
c) Acetone on reaction with NH_3 forms two compounds which are resolvable
d) Acetaldehyde on reaction with NH_2OH forms two compounds which have different melting points

241. Which of the following statements is/are wrong about the more stability of chair form than boat form?
a) In chair conformation, all the $(C-H)$ bonds in adjacent carbons are in the skew position
b) In boat conformations, there are four skew interactions and two eclipsed intractions
c) In boat conformation, there is steric repulsion between two flag poles
d) In boat conformation, there are three skew interactions and three eclipsed interactions

242. Which of the following statements is/are correct?
a) Nitroprusside ion is $[Fe(CN)_5\ NO]^{2-}$
b) Nitroprusside ion is $[Fe(CN)_5\ NOS]^{2-}$
c) Prussian blue and Turnbull's blue, respectively, are $Fe_4[Fe(CN)_6]_3$and $Fe_3[Fe(CN)_6]_2$
d) Prussian blue and Turnbull's blue, respectively, are $Fe_3[Fe(CN)_6]_2$and $Fe_4[Fe(CN)_6]_3$

243. Which of the following is/are optically active?
a)  b)  c)  d) 

244. Which of the following statements is/are wrong?
a) Sulphur is estimated by Carius method as $BaSO_4$
b) Victor Meyer's method is used for the determination of molecular mass of a non- volatile compound

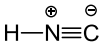
c) Kjeldahl's method is used for all nitrogen-containing organic compounds
d) Phosphorous is estimated by Carius method as $Mg(NH_4).PO_4$

245. Which of the following are electrophiles?
a) $BeCl_2$ b) $CH_2 = CH_2$ c) HCl d) BCl_3

246. Which of the following statements are correct?
a) Butan-2-one shows tautomerism
b) Compounds containing asymmetric C atoms are always optically active
c) Members belonging to the same class of compounds are called isomers
d) Isomers have the same molecular formula

247. Which of the following statement(s) is/are correct?
a) Inductive effect is permanent shifting of σ $\bar{e}$'s towards more EN element
b) Mesomeric effect is delocalization of LP $\bar{e}$'s with π $\bar{e}$'s in conjugation
c) Hyperconjugation is simultaneous shift of σ and π $\bar{e}$'s at 1,3-position without the movement of H atom from its position
d) Tautomerism is simultaneous shift of σ and π $\bar{e}$'s at 1,3-position with the movement of H atom from its position

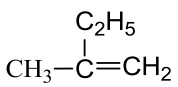
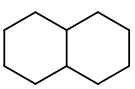
248. Among the following which is correct?
a) Both cyclopentadienyl anion and benzene are aromatic andhave the same stability
b) Benzene is aromatic and more stable than cyclopentadienyl anion and it is nonaromatic
c) Both cyclopentadienyl anion and benzene are aromatic, but benzene is more stable than cyclopentadienyl anion
d) Cyclopentadienyl anion is more stable than benzene although both are aromatic

249. Which of the following statements are wrong?
a) Isobutane and n-butane are chain isomers
b) Ethyl cyanide and ethyl isocyanide are functional isomers
c) $H - C \equiv N$ and  and  are tautomers
d) Maleic and fumaric acids are enantiomers

250. Which of the following group(s) is/are m-directing?
a) $-Cl$
b) $Ph - CH = CH_2$
c) $-CHO$
d) $-COOH$

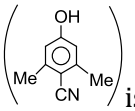
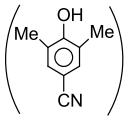
251. Which of the following statements regarding 1,3-dimethyl cyclobutane is/are correct?
a) Both *cis*and *trans*forms are optically active
b) Both *cis*and *trans*forms are optically inactive
c) The *cis*form is optically active, while the *trans*form is optically inactive
d) The *trans*form is optically active, while the *cis* form is optically inactive

252. Which of the following statements is/are correct?
a) Aluminium wire is used in Beilstein test
b) Nitrogen gas is quantitatively estimated in Dumas method
c) In Kjeldahl's method, organic compound is reacted with conc. H_2SO_4, K_2SO_4 and Na_2SO_4 are also added
d) All organic compounds contain both C and H

253. Which of the following will show geometrical isomerism?
a)  b) $[Pt(NH_3)_2Cl_2]$ c) $[Cr(NH_3)_4Cl_2]^{\oplus}$ d) 

254. An organic compound contains about 52% carbon. It could be
a) Phenol b) Dimethyl ether c) Ethanol d) Acetic acid

255. Which of the following statements is/are correct?

a) 3,5-Dimethyl-4-cyanophenol (I)  is more acidic than the isomeric 2,6-dimethyl-4-cyanophenol (II) 

b) (II) is more acidic than (I)

c) (I) is more acidic than (II) due to no steric inhibition of the two Me groups with (CN) groups, since (−CN) group is linear

d) Acidic character of (I) and (II) is determined by +I effect of two Me groups in (I) and +I and H.C effects of two Me groups in (II)

256. When benzene sulphuric acid and *p*-nitrophenol are treated with $NaHCO_3$, the gases released, respectively are:

a) SO_2, NO_2 b) SO_2, NO c) SO_2, CO_2 d) CO_2, CO_2

257. Which of the following statements is/are correct?

a) Methane was named as fire damp as it forms explosive mixture with air

b) Primary suffixes are added to the root word to show saturation or unsaturation in a C atom

c) The IUPAC name of valeric acid is pentanoic acid

d) The common name of hexanoic acid is caproic acid

258. Which of the following have – M effect ($\bar{e}$-withdrawing mesomeric effect)?

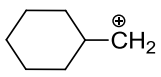
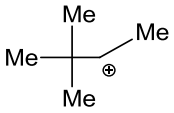
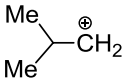
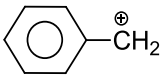
a)  b) $-SO_3H$ c) $-OR$ d) $-Br$

259. Which of the following common reactions occur during Duma's method and Leibig's method?

a) $C + 2CuO \xrightarrow{\Delta} 2Cu + CO_2$ b) $2H + CuO \xrightarrow{\Delta} Cu + H_2O$

c) $N + CuO \rightarrow N_2$ +Oxides of nitrogen d) $NaPO_4 + 3HNO_3 \xrightarrow{\Delta} H_3PO_4 + 3NaNO_3$

260. In which of the following ΔG decreases if there can be some intramolecular rearrangement?

a)  b)  c)  d) 

261. Which of the following statements are correct?

a) $-I$ groups stabilize a carbocation b) $-I$ groups stabilize a carbanion

c) $+I$ groups stabilize a carbanion d) $+I$ groups stabilize a carbocation

262. Which of the following statements are correct?

a) Methyl cyclopropane and methyl cyclobutane do not show stereoisomerism

b) Both show stereoisomerism

c) Dimethyl cyclopropane shows stereoisomerism, but methyl cyclobutane does not

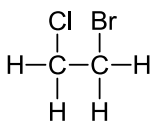
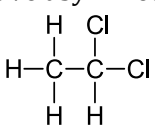
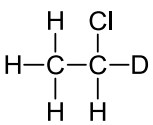
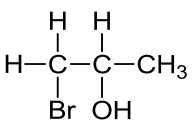
d) Dimethyl cyclopropane does not show stereoisomerism, but methyl cyclobutane shows

263. Which of the following will not show geometrical isomerism?

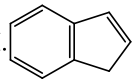
a) $Ph - N = N - Ph$ b) 2,4- Dinitro phenyl hydrazone of acetone

c) Oxime of formaldehyde d) Cyclohexan-1,2-diol

264. Which of the following has/have asymmetric carbon atom?

a)  b)  c)  d) 

265. The decreasing order of pK_a value of the following is:

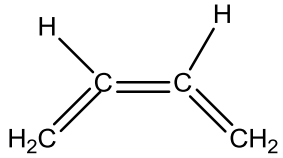
I. $CH \equiv CH$ II.  III. 

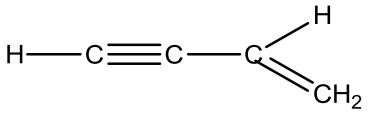
a) III > *I* > *II* b) II > *I* > *III* c) I > *III* > *II* d) I > *II* ≡ *III*

266. Which of the following statements is/are correct?

a) Liebig's method is used for the quantitative estimation of both C and H
b) Dumas method is used for the quantitative estimation of N in all nitrogen-containing organic compounds
c) In Liebig's combustion method, ordinary CuO is used
d) Silver salt method is a chemical method for the determination of equivalent mass of organic acids

267. Amongst the given options, the compound (s) in which all the atoms are in one plane on all the possible conformations (if any), is (are)

a) 

b) 

c) $H_2C = C = O$

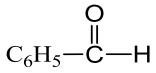
d) $H_2C = C = CH_2$

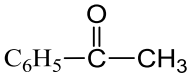
268. Which of the following compounds can be purified by steam distillation?
a) Nitrobenzene
b) Bromobenzene
c) Salicyladehyde
d) *p*-hydroxybenzaldehyde

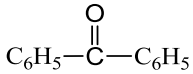
269. Kjeldahl's method can't be used for estimation of nitrogen in
a) Pyridine
b) $C_6H_5NO_2$
c) $C_6H_5NHCOCH_3$
d) $C_6H_5 - N = N - C_6H_5$

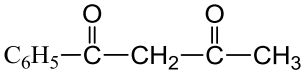
270. Which of the following statements is/are correct?
a) Homologous series can be represented by a general formula
b) The chemical properties of an organic compound depend on the functional group
c) Groups obtained by the removal of one H atoms from the alkane are called alkyl groups
d) Alkynes consist of one double-bond in their molecules

271. Keto-enoltautomerism is observed in

a) 

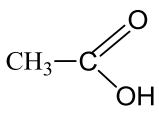
b) 

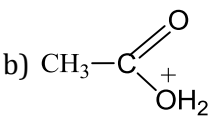
c) 

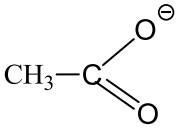
d) 

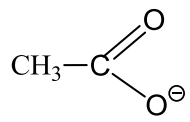
272. Which of the following statements is/are correct?
a) The trivial names of organic compounds are called common names
b) The systematic names of organic compounds are obtained from the IUPAC system
c) The systematic names of alkanes are based on the number of C atoms in the longest continuous chain of C atoms
d) The maximum number of functional groups must be included in the C atom chain selected even if it does not satisfy the longest chain rule

273. Which of the following structure have resonance stability?

a) 

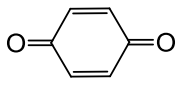
b) 

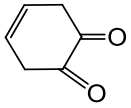
c) 

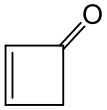
d) 

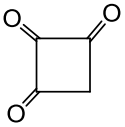
274. The molecule(s) that will have dipole moment is/are:
a) 2,2-Dimethyl propane
b) *trans*-2-Pentene
c) *cis*-3-Hexene
d) 2,2,3,3-Tetramethyl butane

275. Which of the following show stable or major form of tautomerism?

a) 

b) 

c) 

d) 

276. Which of the following methods are used for resolution?
a) Biological methods by using special enzymes
b) By making their diastereomers
c) Chromatographic method using special
d) Azetotropic distillation

adsorbents

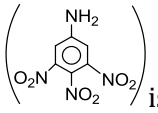
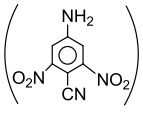
277. The stable conformer(s) of *trans*-1,4-dimethyl cyclohexane is/are:
   a) 1-axial-4-equatorial form
   b) 1-axial-4-axial form
   c) 1-equatorial-4-axial form
   d) 1-equatorial -4-equatorial form

278. Which of the following have +M effect ($\bar{e}$-donating mesomeric effect)
   a) $-NO_2$ b) $-COOH$ c) $-NH_2$ d) $-SR$

279. According to Baeyer's strain theory, which of the following is/are most stable cyclic compounds?
   a) Cyclopropane b) Cyclobutane c) Cyclopentane d) Cyclohexane

280. Which of the following statements is/are wrong?
   a) Acetic acid is the systematic name of vinegar
   b) $Me-\overset{\overset{O}{\|}}{C}-OH$ is an unsaturated compound
   c) Prefixes like $n-$, iso, $sec-$, $tert$, neo-, etc., are used in IUPAC system
   d) The systematic names of acids are formed by dropping –e of the name of parent alkane and adding –oic acid

281. Which of the following statements is/are correct?
   a) The IUPAC name of amyl alcohol is pentanol
   b) The IUPAC name of isoamyl alcohol is 3-methyl butanol
   c) Wood spirit is methanol
   d) Methyl alcohol is also called carbinol

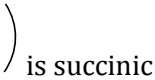
282. Which of the following statement(s) is/are correct?
   a) 3,4,5-Trinitroaniline (I)  is more basic than 4-cyano-3,5-dinitroaniline (II) 
   b) (II) is more basic than (I)
   c) (I) is more basic than (II) due to steric inhibition of resonance in (I)
   d) There is no steric inhibition of resonance in (II)

283. Which of the following statements regarding 1,3-dimethyl cyclobutane is/are correct?
   a) The *cis* form has a plane of symmetry, while the *trans* form has both plane and centre of symmetry
   b) The *cis* form has both plane and centre of symmetry, while the *trans* form has only plane of symmetry
   c) Both have only plane of symmetry
   d) Neither of them has any element of symmetry

284. What is the decreasing order of strengths of the following bases?

   $OH, NH_2^{\ominus}, H-C\equiv C^{\ominus}$, and $CH_3-CH_2^{\ominus}$

   a) $CH_3-CH_2^{\ominus} > NH_2^{\ominus} > H-C\equiv C^{\ominus} > \overset{\ominus}{O}H$
   b) $H-C\equiv C^{\ominus} > CH_3-CH_2^{\ominus} > NH_2^{\ominus} > \overset{\ominus}{O}H$
   c) $\overset{\ominus}{O}H > NH_2^{\ominus} > H-C\equiv C^{\ominus} > CH_3-CH_2^{\ominus}$
   d) $NH_2^{\ominus} > H-C\equiv C^{\ominus} > \overset{\ominus}{O}H > CH_3-CH_2^{\ominus}$

285. Which of the following statements is/are correct?
   a) The common name of $(HOOC-CH_2-COOH)$ is malonic acid
   b) The common name of  is succinic acid
   c) The IUPAC name of $(CH_2=CH-OCOCH_3)$ is vinyl acetate
   d) The IUPAC name of acrylonitrile is pror-2-ene-nitrile

286. Which of the following statements are wrong?
   a) *m*-Chlorobromo benzene is an isomer of *m*-boromochloro benzene
   b) All alkenes show geometrical isomerism
   c) Dimethyl ether and ethanol are functional isomers
   d) Geometrical isomers have different physical properties

287. Br has a low reactivity in $CH_2=CH-Br$ because

a) Br is electronegative
b) Of the $+M$ effect of bromine
c) The $C-Br$ bond has a partial double bond character
d) None of the above

288. Which of the following species are planar?
a) Isopropyl carbanion
b) Nitromethyl carbanion
c) Singlet carbene
d) Triphenylmethyl carbocation

289. Which of the following statements is/are correct?
a) The common name of benzene-1,2,3-triol is pyrogallol
b) The common name of benzene-1,2,4-triol is hydroxyquinol
c) The common name of benzene-1,3,5-triol is phloroglucinol
d) The common name of $(CH_2 = CH - Ph)$ is styrene

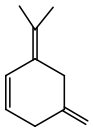
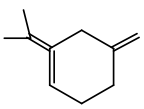
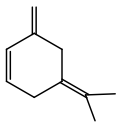
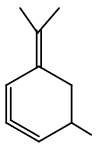
290. Which of the following statements is/are correct?
a) Molecular formula or molecular mass of a gaseous hydrocarbon can be determined even without knowing their percentage composition by eudiometry
b) In Lassaigne's test, N and S both present in the organic compound are converted into CNS ion
c) K_2SO_4 and $CuSO_4$ are added in Kjeldahl's method. K_2SO_4 acts as a catalyst while $CuSO_4$ raises the boiling point of H_2SO_4
d) Layer test is used to distinguish $Cl^{\ominus}$ and$Br^{\ominus}$ ions

291. Which of the following statements is/are correct?
a) In Lassaigne's test for halogens , conc. HNO_3 is used to remove HCN and H_2S
b) When an organic compound is heated with dry CuO and the gases evolved are passed through lime water which turns milky, the gas may be CO_2 or SO_2
c) In Carius method, sulphur is oxidised toSO_4^{2-} ion with fuming HNO_3
d) In Lassaigne's test, N present in the organic compound is converted into $CN^{\ominus}$ ions

292. Which of the following are nucleophiles?
a) PH_3
b) $F^{\ominus}$
c) $Ph_3S^{\ominus}$
d) H_2O

293. Which of the following statements is/are correct?
a) HCOOH is stronger acid than PhCOOH
b) Oximes$(R_2C = N - OH)$ are more acidic than hydroxyl-amine (NH_2OH)
c) $R_3Si\ CH_2COOH$ is more acidic than $R_3C\ CH_2COOH$
d) Highly branched carboxylic acids are less acidic than unbranched acids

294. An unsaturated hydrocarbon on complete hydrogenation gives 1- isopropy-3-methylcyclohexane, after ozonolysis it gives one mole of formaldehyde, one mole of acetone and one mole of 2,4-dioxohexanedial. The possible structure/s of the hydrocarbon may be

a) 
b) 
c) 
d) 

295. Which of the following statement is correct?
a) Impure glycerine can be purified by ordinary distillation
b) Ethanol and water can't be separated from each other completely by simple distillation method as they form azeotropic mixture
c) Two solid organic substances are said to be different if their mixed melting point is depressed below the melting points of both of these
d) All of the above

Assertion - Reasoning Type

This section contain(s) 0 questions numbered 296 to 295. Each question contains STATEMENT 1(Assertion) and STATEMENT 2(Reason). Each question has the 4 choices (a), (b), (c) and (d) out of which **ONLY ONE** is

correct.

a) Statement 1 is True, Statement 2 is True; Statement 2 **is** correct explanation for Statement 1

b) Statement 1 is True, Statement 2 is True; Statement 2 **is not** correct explanation for Statement 1

c) Statement 1 is True, Statement 2 is False

d) Statement 1 is False, Statement 2 is True

296

Statement 1: Essential oils are volatile and are insoluble in H_2O

Statement 2: Essential oils are purified by steam distillation

297

Statement 1: In organic layer test, Cl_2, water is added to the sodium extract, which oxides $Br^{\ominus}$ and $I^{\ominus}$ ion to Br_2 and I_2, respectively

Statement 2: Reduction potential of Cl_2 is greater than that of Br_2 and I_2

298

Statement 1: Pentane and 3-methyl pentane are chain isomers

Statement 2: Pentane is a straight–chain alkane while 3-methyl pentane is a branched-chain alkane

299

Statement 1: Dehydration of alcohol is an example of elimination reaction

Statement 2: When H_2SO_4 or H_3PO_4(concentrated) are used as dehydrating agent, the mechanism is E_1

300

Statement 1: Alkene A ($Me_2C = CMe_2$) is more stable than alkene B ($Et_2C = CEt_2$)

Statement 2: Baker-Nathan effect

301

Statement 1: Equivalent weight of ozone in the change $O_3 \rightarrow O_2$ is 8.

Statement 2: 1 mole O_3 of on decomposition gives $\frac{3}{2}$ moles of O_2.

302

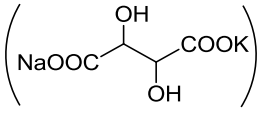
Statement 1: The pK_a value of  (I) is lower than the pK_a value of  (II)

Statement 2: Nonaromatic compounds are more stable than anti-aromatic compounds

303

Statement 1: Rochelle's salt is used as a complexing agent in Tollens reagent

Statement 2: Sodium potassium salt of tartaric acid is known as Rochelle's salt. The IUPAC name of Rochelle's salt



is sodium potassium-2,3-dihydroxy butane-1,4-dioate.

304

Statement 1: The order of stability of carbocation are $R_3C^+ > R_2\overset{+}{C}H > R\overset{+}{C}H_2 > \overset{+}{C}H_3$.

Statement 2: The stability of carbocations is influenced by both resonance and inductive effects

305

Statement 1: All the C atoms of but-2-ene lie in one plane

Statement 2: Double-bond C atoms are sp^2 hybridised

306

Statement 1: Both *cis*-1, 3-dimethyl cyclobutane and *trans*-1,3-dimethyl cyclobutane are optically inactive

Statement 2: *cis*-1,3-Dimethyl cyclobutane has the plane of symmetry, whereas *trans* form has the centre of symmetry

307

Statement 1: *p*-methyl benzyl carbocation (I) is more stable than benzyl carbocation (II)

Statement 2: Heterovalent or no bond resonance

308

Statement 1: Benzene (boiling point353 K) and methanol (boiling point338 K) are separated by simple distillation

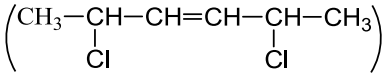
Statement 2: Fractional distillation is used to separate two liquids from their mixture when their boiling points differ by 20° or so

309

Statement 1: Normally and molarity can be calculated from each other.

Statement 2: Normally is equal to the product of molarity and n.

310

Statement 1: The *cis* form of


exist in three-diastereomers

Statement 2: One form is optically inactive due to the presence of centre of symmetry

311

Statement 1: Dumas method is more applicable to nitrogen containing organic compounds than Kjeldahl's method.

Statement 2: Kjeldahl's method does not give satisfactory results for compounds in which N is linked to O atom

312

Statement 1: Electrophile are electron rich in nature

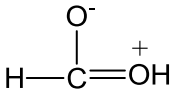
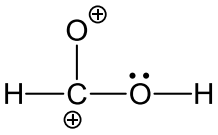
Statement 2: H_3O^+, BF_3 and $AlCl_3$ are electrophile and can accept electron pair

313

Statement 1: The empirical formula of glucose is CH_2O which represents the relative number of atoms of each atom present in this molecule

Statement 2: In glucose, the elements C, H, O have combined in the ratio 1:2:1

314

Statement 1:  is more stable than 

Statement 2: Compound in which the positive and negative charges reside on the most electropositive and most electronegative atoms of the species respectively is more stable

315

Statement 1: Equivalent of $K_2Cr_2O_7$ has 1 equivalent of K and Cr and O each.

Statement 2: A species contains same number of equivalents of its components.

316

Statement 1: The IUPAC name of isoprene is 2-methyl buta-1,3-diene

Statement 2: Isoprene unit is a monomer of natural rubber

317

Statement 1: Pent-1-ene and 2-methyl but-1-ene are position isomers

Statement 2: Position isomers have the same molecular formula but differ in the position of functional group

318

Statement 1: Carbanion like ammonia have pyramidal shape

Statement 2: The carbon atom carrying negative charge has an octet of electrons

319

Statement 1: Hydroxylamine (NH_2OH) contains N, and hence gives Prussian blue colour in Lassaigne's test

Statement 2: Hydroxylamine does not contain C, so with Na metal, $CN^{\ominus}$ ion is not formed

320

Statement 1: A solution which contains one gram equivalent of solute per litre of solutions is known as molar solution.

Statement 2: Normality=normality $\times \frac{\text{mol.wt.of solute}}{\text{eq.wt.of solute}}$

321

Statement 1: Methylene has a sextet of $\bar{e}$'s

Statement 2: Methylene behaves as a nucleophile

322

Statement 1: Pentane and 2-methyl pentane are homolo-gues

Statement 2: Pentane is a straight-chain alkane, while 2-methyl pentane is a branched-chain alkane

323

Statement 1: Lessaigne's test is the for nitrogen only

Statement 2: If halogens are present in organic compound, it react with sodium to form sodium halides which dissolves in water

324

Statement 1: In Messenger's method, the colourless solution, the liquid is transferred to beaker and barium chloride added to estimate sulphuric acid as $BaSO_4$ in the usual way

Statement 2: If an experiment 0.36 g of an organic compound gave 0.35 of $BaSO_4$. the percentage of sulphur in the compound is 13.35%

325

Statement 1: (A): $Me_3\overset{\ominus}{C}$ is more stable than $\overset{\ominus}{C}H_3$

Statement 2: The +I effect of the three Me groups in $Me_3\overset{\ominus}{C}$ tends to makeit more stable than $\overset{\ominus}{C}H_3$

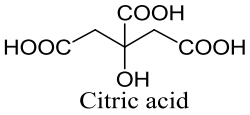
326

Statement 1: Metamers can also be position or chain isomers

Statement 2: Tautomerism was introduced by C.P. Laar to explain the chemical reactivity of a substance according to two possible structures

327

Statement 1: The IUPAC name of citric acid is 2-hydroxy-propane-1,2,3-tricarboxylic acid



Citric acid

Statement 2: When an unbranched C atom is directly linked to more than two like-functional groups, then it is named as a derivative of the parent alkane which does not include the C atoms of the functional groups

328

Statement 1: The molality of the solution does not change with change in temperature.

Statement 2: The molality of the solution is expressed in units of moles per 1000 g of solvent.

329

Statement 1: Benzoic acid is purified by sublimation process

Statement 2: Sublimation process is very useful in separating a volatile solid from a non-volatile solid

330

Statement 1: 'A Victor Mayer tube' of hard glass, having a side-tube, leading to the arrangement for collection of displaced air over water.

Statement 2: An outer jacket of copper, containing a liquid boiling at nearly 30°C higher than the substance whose molecular mass is to be determined

Matrix-Match Type

This section contain(s) 0 question(s). Each question contains Statements given in 2 columns which have to be matched. Statements (A, B, C, D) in **columns I** have to be matched with Statements (p, q, r, s) in **columns II**.

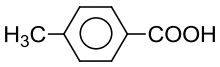
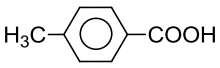
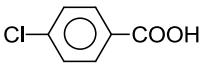
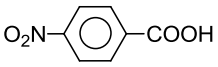
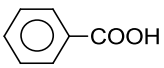
331.

Column-I	Column- II
(A) Victor Meyer's method	(p) Quantitative estimation of N in methane amine
(B) Chloroplatinate method	(q) Molecular mass of a volatile organic compound
(C) Elevation in boiling point	(r) Equivalent mass of an organic base
(D) Dumas method	(s) Molecular mass of a non-volatile organic compound

CODES :

	A	B	C	D
a)	r	s	p	q
b)	p	q	r	s
c)	q	r	s	p
d)	s	p	q	r

332.

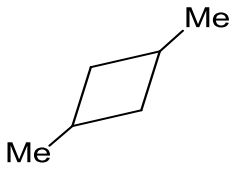
Column-I	Column- II
(A) 	(p) 3.3×10^{-5}
(B) 	(q) 30.6×10^{-5}
(C) 	(r) 6.3×10^{-5}
(D) 	(s) 6.4×10^{-5}
(E) 	(t) 4.3×10^{-5}

CODES :

A	B	C	D	E

a)	r	q	t	p	s
b)	r	s	q	t	s
c)	t	p	s	q	s
d)	r	t	p	s	s
e)	r	p	t	s	s

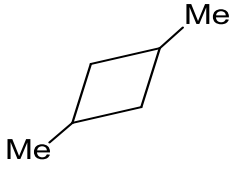
333.

Column-I		Column- II
(A)	Number of diastereomers of $C_2FClBrI$	(p) 4
(B)	Number of isomeric alcohols of $C_4H_{10}O$	(q) 3
(C)	Number of isomeric esters of $C_4H_8O_2$	(r) 6
(D)	Number of stereoisomers of 	(s) 2

CODES :

	A	**B**	**C**	**D**
a)	r	p	p	s
b)	p	s	q	r
c)	r	p	s	q
d)	s	r	p	p

334.

Column-I		Column- II
(A)	Number of diastereomers of $C_2FClBrI$	(p) 4
(B)	Number of isomeric alcohols of $C_4H_{10}O$	(q) 3
(C)	Number of isomeric esters of $C_4H_8O_2$	(r) 6
(D)	Number of stereoisomers of 	(s) 2

CODES :

	A	B	C	D
a)	r	p	p	s
b)	p	s	q	r
c)	r	p	s	q
d)	s	r	p	p

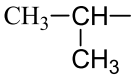
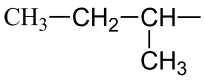
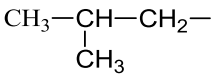
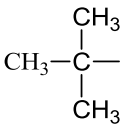
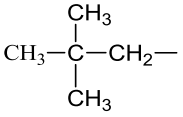
335.

Column-I		Column- II
(A)	Li^+, Mg^{2+}, Al^{3+}	(p) Soft acids
(B)	Cu^+, Cd^{2+}, Pt^{4+}	(q) Soft bases
(C)	$\overset{\ominus}{OH}, NO_3^{\ominus}, CO_3^{2-}$	(r) Hard acids
(D)	$H^{\ominus}, I^{\ominus}, CN^{\ominus}$	(s) Hard bases

CODES :

	A	B	C	D
a)	r	p	s	q
b)	q	s	p	r
c)	r	p	s	r
d)	s	p	r	r

336.

Column-I		Column- II
(A)		(p) *sec*-Butyl
(B)		(q) *tert*-Butyl
(C)		(r) Isopropyl
(D)		(s) Neopentyl
(E)		(t) Isobutyl

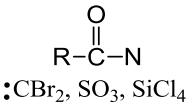
CODES :

	A	B	C	D	E
a)	R	p	t	q	s
b)	p	t	q	s	s

c) t q s r s

d) q s r p s

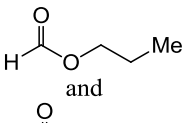
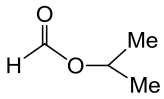
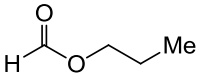
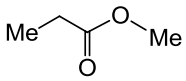
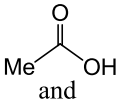
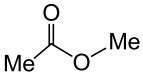
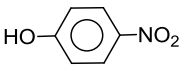
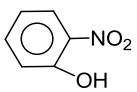
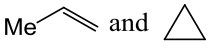
337.

	Column-I	Column- II
(A)	 :CBr_2, SO_3, $SiCl_4$	(p) Nucleophiles
(B)	RCHO, RCN	(q) Neither
(C)	$NH_3, CH_2 = CH_2, Me_3P$	(r) Electrophiles
(D)	H_2, CH_4	(s) Both electrophile and nucleophile

CODES :

	A	**B**	**C**	**D**
a)	r	s	p	q
b)	s	p	q	r
c)	p	s	q	r
d)	s	q	p	r

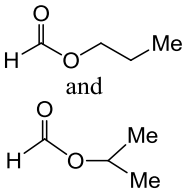
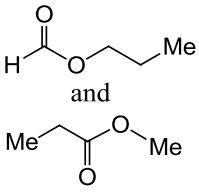
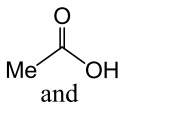
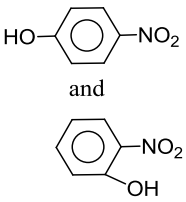
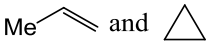
338.

	Column-I	Column- II
(A)	 and 	(p) Ring chain
(B)	 and 	(q) Metamer
(C)	 and 	(r) Position
(D)	 and 	(s) Functional
(E)		(t)

CODES :

	A	B	C	D	E
a)	R	q	s	p	r
b)	r	q	s	r	r
c)	q	s	r	r	r
d)	r	r	p	q	r
e)	r	p	q	r	r

339.

Column-I		Column- II
(A)		(p) Ring chain
(B)		(q) Metamer
(C)		(r) Position
(D)		(s) Functional
(E)		(t)

CODES :

	A	B	C	D	E
a)	R	q	s	p	r
b)	r	q	s	r	r
c)	q	s	r	r	r
d)	r	r	p	q	r
e)	r	p	q	r	r

340. Match the compounds in column I with their structure (*s*)/ characteristic (s)/test(s)/reaction(s)/stereochemistry, etc., given column II. Matching can be one or more than one

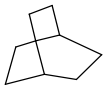
Column-I	Column- II

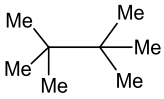
(A) C_8H_{18} with only 1° H atoms

(B) C_6H_{12} with only 2° H atoms

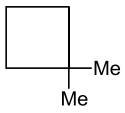
(C) C_6H_{12} with only 1° and 2° H atoms

(D) C_8H_{14} with 12 secondary and 2 tertiary H atoms

(p) 

(q) 

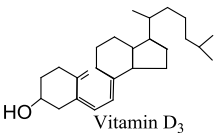
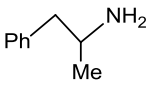
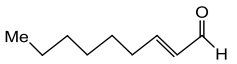
(r) 

(s) 

CODES :

	A	**B**	**C**	**D**
a)	Q	r	s	p
b)	p	q	r	s
c)	q	r	s	p
d)	r	s	p	q

341.

Column-I	**Column- II**
(A)  Vitamin D_3	(p) 1° amine
(B)  Amphetamine	(q) 2° alcohol
(C)  A cockroach repellent found in cucumbers	(r) Triene
	(s) Aldehyde and ene

CODES :

	A	**B**	**C**	**D**
a)	S	r	p,q	
b)	p	q	s,r	
c)	r,q	p	s	
d)	p	s,r	q	

342.

Column-I	**Column- II**
(A) High electronegativity and low polarisability	(p) Soft bases

(B) Low electronegativity and High polarisability (q) Hard bases

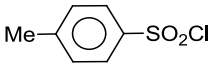
(C) Small size with high positive oxidation state (r) Soft acids

(D) Large size with zero or low positive oxidation state (s) Hard acids

CODES :

	A	**B**	**C**	**D**
a)	P,r	q,s	s	r
b)	q,s	p,r	s	r
c)	s	r	p,r	q,s
d)	p,r	r	q,s	s

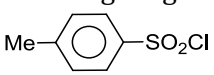
343.

Column-I	**Column- II**
(A) 1° and 2° amines	(p) $NaHSO_3$
(B) Ethanal and ethanol	(q) Hinsberg reagent ($PhSO_2Cl$) or 
(C) $(C_2H_5)_2NH$ and butanol	(r) Dil. NaOH and distillation
(D) $(C_2H_5)_2C=O$ and CH_3COOH	(s) Dil. H_2SO_4 and steam distillation

CODES :

	A	**B**	**C**	**D**
a)	q	p	s	r
b)	p	r	s	q
c)	r	s	q	p
d)	s	q	p	s

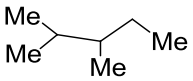
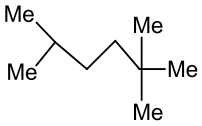
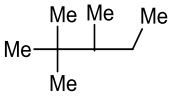
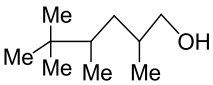
344.

Column-I	**Column- II**
(A) 1° and 2° amines	(p) $NaHSO_3$
(B) Ethanal and ethanol	(q) Hinsberg reagent ($PhSO_2Cl$) or 
(C) $(C_2H_5)_2NH$ and butanol	(r) Dil. NaOH and distillation
(D) $(C_2H_5)_2C=O$ and CH_3COOH	(s) Dil. H_2SO_4 and steam distillation

CODES :

	A	B	C	D
a)	q	p	s	r
b)	p	r	s	q
c)	r	s	q	p
d)	s	q	p	s

345.

Column-I	Column- II
(A) 	(p) 15(1°H), 4(2°H), 1(3°H)
(B) 	(q) 17(1°H), 2(2°H), 2(3°H)
(C) 	(r) 12(1°H), 2(2°H), 2°(3°H)
(D) 	(s) 15(1°H), 2(2°H), 1°(3°H)

CODES :

	A	B	C	D
a)	P	s	q	r
b)	r	p	s	q
c)	s	q	r	p
d)	q	r	p	s

346. Compare List I and List II and choose the correct matching codes from the choices given.

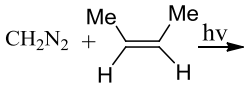
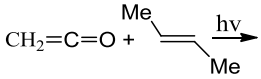
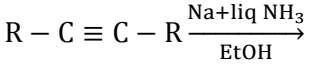
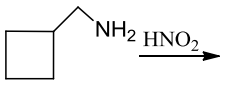
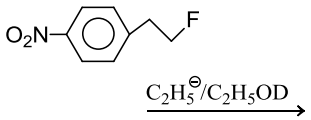
Column-I	Column- II
(A) Glycerol	(1) Sublimation
(B) *o*-nitrophenol	(2) Beilstein's test
(C) Anthracene	(3) Victor-Meyer's method
(D) Halogens	(4) Steam distillation
(E) Molecular weight	(5) Vacuum distillation
	(6) Eudiometry

CODES :

	A	B	C	D	E
a)	5	4	1	2	3

b)	4	5	1	6	3
c)	6	4	1	3	3
d)	5	4	6	2	3
e)	4	6	2	3	3

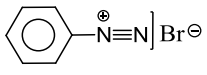
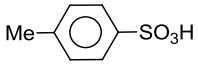
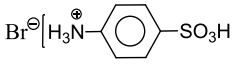
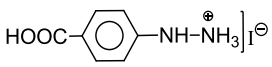
347.

Column-I		**Column- II**
(A)		(p) Radical anion
(B)		(q) Carbanion
(C)		(r) Triplet carbene
(D)		(s) Singlet carbene
(E)		(t) Carbocation

CODES :

	A	**B**	**C**	**D**	**E**
a)	t	s	p	r	p
b)	p	s	r	p	p
c)	t	p	s	r	p
d)	s	r	p	t	p
e)	r	p	t	s	p

348.

Column-I		**Column- II**
(A)		(p) Sodium fusion extract of the compound gives Prussian blue colour with $FeSO_4$
(B)		(q) Sodium fusion extract of the compound gives blood red colour with $FeSO_4$
(C)		(r) Lassaigne's extract (L.E.) in CS_2 and Cl_2 water gives orange colour
(D)		(s) L.E. with $[Fe(CN)_5NO]^{2-}$ gives violet colour

CODES :

	A	**B**	**C**	**D**
a)	s	p	r	q,r
b)	r	s	q,r	p

c)	p	r	q	s
d)	q,r	q	s	r

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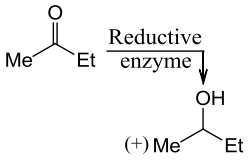
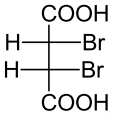
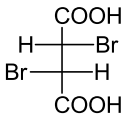
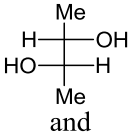
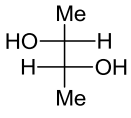
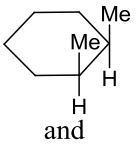
	Column-I		**Column- II**
(A)	Quantitative estimation of C and H in an organic compound	(p)	Kjeldahl's methods
(B)	Equivalent mass of an organic acid	(q)	Carius method
(C)	Quantitative estimation of halogens in organic compound	(r)	Liebig method
(D)	Quantitative estimation of N in nitrobenzene	(s)	Silver salt method

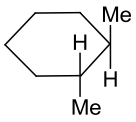
CODES :

	A	**B**	**C**	**D**
a)	R	s	q	p
b)	p	r	s	q
c)	q	p	r	s
d)	s	q	p	r

350.

	Column-I		**Column- II**
(A)		(p)	Diastereomers
(B)	 and 	(q)	Conformation
(C)	 and 	(r)	Asymmetric synthesis

(D) 

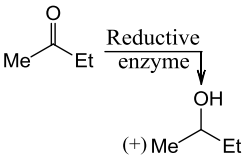
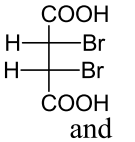
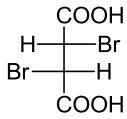
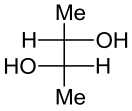
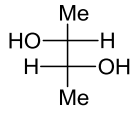
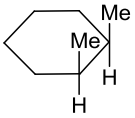
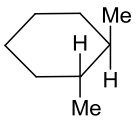
and


(s) Enantiomers

CODES :

	A	**B**	**C**	**D**
a)	s	p	q	r
b)	r	s	p	q
c)	r	q	s	p
d)	r	p	s	p

351.

Column-I	**Column- II**
(A) 	(p) Diastereomers
(B)  and 	(q) Conformation
(C)  and 	(r) Asymmetric synthesis
(D)  and 	(s) Enantiomers

CODES :

	A	**B**	**C**	**D**
a)	s	p	q	r

b)	r	s	p	q
c)	r	q	s	p
d)	r	p	s	p

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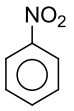
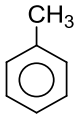
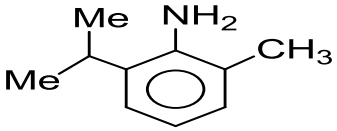
Column-I	**Column- II**
(A) $CH_3 - CH = CH - O - CH_3$	(p) Inductive effect
(B) $CH_2 = CH - Br$	(q) Resonance
(C) 	(r) Hyperconjugation
(D) 	(s) Steric hinderance
(E) 	(t)

CODES :

	A	**B**	**C**	**D**	**E**
a)	P,q,r	p,q,r,s	p,q,r	p,q	p,q
b)	p,q,r	p,q	p,q	p,q,r	p,q
c)	p,q,r,s	p,q,r	p,q	p,q,r	p,q
d)	p,q	p,q,r	p,q	p,q,r,s	p,q
e)	p,q	p,q,r,s	p,q,r	p,q,r	p,q

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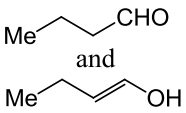
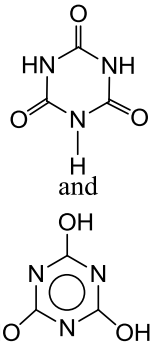
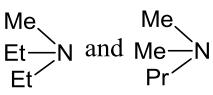
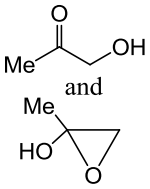
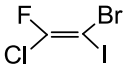
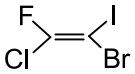
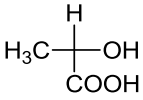
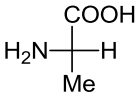
Column-I	**Column- II**
(A) 	(p) Ring chain tautomerism
(B) 	(q) Functional
(C) 	(r) Tautomerism

(D)  (s) Metamerism

CODES :

	A	B	C	D
a)	Q,r	q,r	s	p
b)	q,r	s	p	q,r
c)	p	q,r	q,r	s
d)	q,r	q,r	p	s

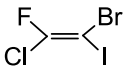
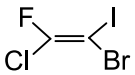
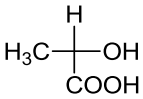
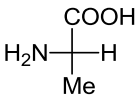
354.

Column-I	Column- II
(A) 	(p) *S*
(B) 	(q) *Z*
(C) 	(r) *E*
(D) 	(s) *R*

CODES :

	A	B	C	D
a)	r	q	s	p
b)	s	p	q	r
c)	q	r	s	p
d)	s	p	r	q

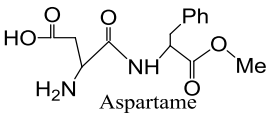
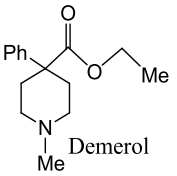
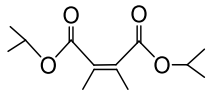
355.

Column-I	Column- II
(A) 	(p) *S*
(B) 	(q) *Z*
(C) 	(r) *E*
(D) 	(s) *R*

CODES :

	A	B	C	D
a)	r	q	s	p
b)	s	p	q	r
c)	q	r	s	p
d)	s	p	r	q

356.

Column-I	Column- II
(A)  Aspartame	(p) Ene and diester
(B)  Demerol	(q) Carboxylic acid, 1° amine, amide
(C)  A synthetic cookroach repellent	(r) Ester
	(s) 3° amine

CODES :

	A	B	C	D
a)	P	q	r,s	
b)	p,q	r	s	
c)	r	q,s	p	
d)	q,r	r,s	p	

357.

Column-I	Column- II
(A) Separated by treatment with dil. NaOH	(p) Toluene and aniline
(B) Extraction with dil.HCl, a compound passes into the aqueous layer in the form of hydrochloride salt and recovered by neutralisation	(q) Toluene and phenol
(C) Separated by $NaHCO_3$solution, a compound forms salt and is recovered after acidification	(r) Diethly ether and chlorobenzene
(D) Separated by conc. H_2SO_4, which dissolves a compound and recovered from solution by dilution with H_2O	(s) *o*-Cresol and benzoic acid

CODES :

	A	B	C	D
a)	p	s	r	q
b)	s	r	q	p
c)	r	q	p	s
d)	q	p	s	r

358.

Column-I		Column- II	
(A)	Separated by treatment with dil. NaOH	(p)	Toluene and aniline
(B)	Extraction with dil.HCl, a compound passes into the aqueous layer in the form of hydrochloride salt and recovered by neutralisation	(q)	Toluene and phenol
(C)	Separated by $NaHCO_3$solution, a compound forms salt and is recovered after acidification	(r)	Diethly ether and chlorobenzene
(D)	Separated by conc. H_2SO_4, which dissolves a compound and recovered from solution by dilution with H_2O	(s)	*o*-Cresol and benzoic acid

CODES :

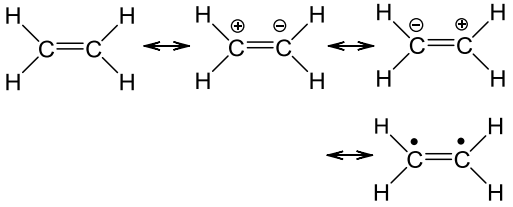
	A	B	C	D
a)	p	s	r	q
b)	s	r	q	p
c)	r	q	p	s
d)	q	p	s	r

Linked Comprehension Type

This section contain(s) 27 paragraph(s) and based upon each paragraph, multiple choice questions have to be answered. Each question has atleast 4 choices (a), (b), (c) and (d) out of which **ONLY ONE** is correct.

Paragraph for Question Nos. 359 to -359

We have already said that resonance effects are encountered mainly in molecule with multiple, ie, π bonds. Except in a few special molecules, the σ-bond framework is not involved in significant resonance interaction. This fact can be rationalized by nothing that electron in π bonds are higher in energy than those in σ-bonds, making the π- bonding electrons more reactive and also more polarizable than σ-bonding electrons. For example, here four structures we might write for ethylene



359. Which of the following compounds shows resonance?

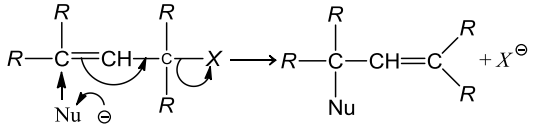
a) Ethyne b) Ethane c) Touene d) Cyclohexene

Paragraph for Question Nos. 360 to - 360

Nucleophilic substitution at an allylic carbon may also takes place by S_N2 mechanism without allylic rearrangement. This mechanism operates with primary allyl halides in the presence of polar aprotic solvents

$$CH_2 = CH - CH_2 - Br \xrightarrow[\text{Acetone}]{\text{NaI}} CH_2 = CH - CH_2 - I$$

However, allylic rearrangement can also take place under S_N2 conditions through the following mechanism in which nucleophilic attacks at the γ-carbon instead of at the usual position. This mechanism is called S_N 2 mechanism and is an allylics rearrangement. S_N2 mechanism takes place under S_N2 conditions where α-substitution sterically retards the normal S_N2 mechanism



360. Which one of the halide is most reactive for S_N2 reaction?

a) $C_6H_5CH_2Cl$ b) $CH_3 - O - CH_2 - Cl$

c) $CH_2 = CH - CH_2 - Cl$ d) $CH_3 - CO - CH_2 - Cl$

Paragraph for Question Nos. 361 to - 361

In Carius method a known mass of the organic compound is heated with excess of fuming HNO_3 and a few crystals of $AgNO_3$ in a sealed tube called Carius tube. C an H are oxidised to CO_2 and H_2O respectively and the halogens are converted into silver halides. The ppt. of silver halide is filtered, washed, dried and weighted. The percentage of halogen can be calculated from the mass of silver halide formed

$$\text{Percentage of Cl} = \frac{35.5}{143.5} = \frac{\text{mass of AgCl formed}}{\text{mass of sub taken}} \times 100$$

$$\text{Percentage of Br} = \frac{80}{188} = \frac{\text{mass of AgCl formed}}{\text{mass of sub taken}} \times 100$$

$$\text{Percentage of I} = \frac{127}{235} = \frac{\text{mass of AgCl formed}}{\text{mass of sub taken}} \times 100$$

361. When 0.35 g of an organic compound is heated with HNO_3 and $AgNO_3$ in a Carius tube, it gives 0.70 g of silver chloride. The percentage of chloride in the compound is

a) 54.8% b) 49.47% c) 34.6% d) 25.85%

Paragraph for Question Nos. 362 to - 362

The molecular formula of a compound gives the actual number of atoms of each element present in a molecule of the compound. It is either the same as the empirical formula or a simple multiple of it.

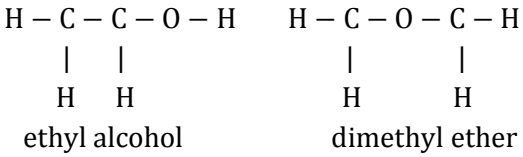
Molecular formula= $(\text{Empirical formula})_n$

Where, n is a whole number and its value is obtained by dividing the molecular mass of the compound by its empirical formula mass.

Structural formula is that formula which shows in what way different kinds of atoms in a molecule are united or linked together

H H H H

| | | |

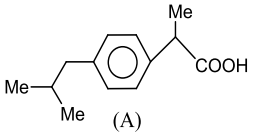


362. What is the molecular formula of a compound, its empirical formula is CH_2O and its molecular weight is 90°?

a) $C_3H_6O_3$ b) $C_6H_6O_3$ c) $C_4H_8O_4$ d) $C_2H_6O_2$

Paragraph for Question Nos. 363 to - 364

The analgesic drug ibuprofen (A) is chiral and exists in (+) and (−) forms. One enantiomer is physiologically active, while the other is inactive. The structure of ibuprofen is given below:

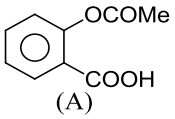


363. The principal functional group in (A) us:

a) Phenyl b) −COOH group c) Isopropyl d) Both (a) and (b)

Paragraph for Question Nos. 364 to - 365

Aspirin is widely used as an analgesic drug. It is optically inactive. The structure of aspirin is:

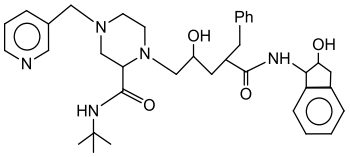


364. The principal functional group in (A) is:

a) Phenyl b) −COOH c) Ester d) All

Paragraph for Question Nos. 365 to - 366

Crixivan, a drug produced by Merck and Co., is widely used in the fight against AIDS (acquired immune deficiency syndrome). The structure of cirxivan of given below:



365. How many 2° alcohol groups are present in the above compound?

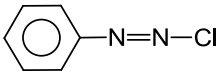
a) Zero b) 1 c) 2 d) 3

Paragraph for Question Nos. 366 to - 367

Qualitative analysis of organic compounds is performed by Lassaigne's test by fusion with metallic sodium, by which the covalent compounds are converted into ionic compounds. Extra elements like N, S, P, and halogens

are detected by their usual tests

366. Which of the following compounds will give positive Lassaigne's test for nitrogen

a) NH_2OH b) NH_2NH_2 c) KCN d) 

Paragraph for Question Nos. 367 to - 368

Quantitative estimation of C, H, and extra elements (e.g., N, S, P and halogens)is carried out by Liebig's combustion, Carius, Dumas, and Kjeldahl's method

367. Liebig's combustion method is used for the quantitative estimation of:

a) C and H b) Halogens c) S and P d) N

Paragraph for Question Nos. 368 to - 369

Twenty millilitres of gaseous hydrocarbon required 400 ml of air for complete combustion. The air contains 20% by volume of oxygen. The volume of gaseous mixture after explosion and cooling was found to be 380 ml

368. Volume of O_2used is:

a) 70 ml b) 75 ml c) 80 ml d) 85 ml

Paragraph for Question Nos. 369 to - 370

In this paragraph, some statements are given based on isomerism. Read the following statements given for every question and provide the answer

369. How many isomeric dienes with a six-membered ring are possible for the compound with molecular formula C_7H_{10}?

a) 5 b) 6 c) 7 d) 8

: ANSWER KEY :

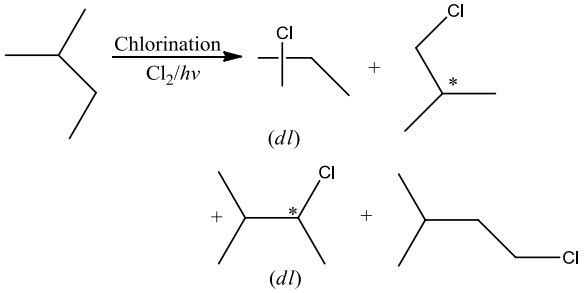
1) a	2) b	3) a	4) a	189) b	190) c	191) a	192) a
5) c	6) b	7) a	8) a	193) b	194) b	195) a	196) d
9) b	10) b	11) a	12) a	197) c	198) c	199) c	200) d
13) b	14) a	15) c	16) c	201) d	202) c	203) a	204) b
17) b	18) a	19) a	20) a	205) a	1) a	2) a,d	3)
21) b	22) c	23) c	24) b	c,d	4) d		
25) c	26) b	27) b	28) c	5) c,d	6) a,c,d	7) a	8)
29) b	30) a	31) a	32) c	c,d			
33) a	34) d	35) b	36) b	9) a,b,c	10) a,b	11) c	12) b
37) b	38) a	39) d	40) a	13) a,b,c,d	14) c,d	15) a,b,c	16) a
41) c	42) b	43) b	44) d	17) a,b,c,d	18) b,c	19) c,d	20)
45) a	46) d	47) a	48) d	a,c,d			
49) a	50) c	51) c	52) d	21) d	22) a,b,c	23) a,c,d	24)
53) d	54) c	55) b	56) c	a,b,c,d			
57) c	58) b	59) c	60) b	25) a	26) c,d	27) b,d	28)
61) c	62) b	63) a	64) b	c,d			
65) c	66) b	67) c	68) a	29) c,d	30) b,d	31) a,c	32) c
69) b	70) b	71) b	72) b	33) a,c	34) c,d	35) a,d	36)
73) a	74) a	75) d	76) d	d,e			
77) a	78) c	79) b	80) a	37) a,c	38) b	39) c,d	40)
81) d	82) a	83) c	84) b	a,c,d			
85) d	86) a	87) c	88) d	41) a,d	42) a,b,c,d	43) c	44) d
89) d	90) a	91) a	92) d	45) c,d	46) b	47) b	48)
93) c	94) c	95) a	96) a	b,c,d			
97) b	98) c	99) a	100) a	49) b,c	50) a,c,d	51) d	52)
101) b	102) a	103) c	104) d	a,b,c,d			
105) b	106) b	107) d	108) a	53) a,b	54) a,b	55) a,b,c	56)
109) b	110) c	111) a	112) d	b,d			
113) b	114) b	115) a	116) b	57) a,c	58) b,c	59) c,d	60) b
117) a	118) b	119) a	120) b	61) a,b,d	62) b, c	63) a,b,c	64)
121) d	122) a	123) a	124) b	a,b,d			
125) a	126) b	127) d	128) c	65) a,b,c	66) b,d	67) a,b,c,d	68)
129) b	130) a	131) a	132) c	c,d			
133) c	134) b	135) b	136) a	69) b,c	70) b,d	71) a,b,c	72) d
137) c	138) b	139) a	140) c	73) c,d	74) c	75) a,b,c	76)
141) c	142) b	143) a	144) c	a,b,c,d			
145) d	146) d	147) c	148) c	77) a,c,d	78) a	79) a	80)
149) a	150) a	151) d	152) b	a,b,d			
153) d	154) b	155) b	156) d	81) a,b	82) b,c	83) b,c	84)
157) d	158) b	159) c	160) c	a,b,c,d			
161) a	162) b	163) a	164) a	85) a,b	86) a,b,c,d	87) a,b,c,d	88)
165) a	166) a	167) c	168) a	a,b,d			
169) a	170) b	171) a	172) c	89) a,c	90) b,c	1) a	2) a
173) b	174) a	175) b	176) d	3) d	4) b		
177) a	178) d	179) d	180) c	5) a	6) b	7) a	8) b
181) d	182) a	183) c	184) b	9) c	10) a	11) a	12) a
185) c	186) b	187) b	188) b	13) c	14) a	15) c	16) b

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

: HINTS AND SOLUTIONS :

1 **(a)**

On chlorination of 2-methyl butane



2-chiral compound are formed.

2 **(b)**

$CO + \frac{1}{2}O_2 \rightarrow CO_2$

40 ml 20 ml 40 ml

↓ KOH

absorbed

Volume of O_2 left $= (100 - 20) = 80$ ml

3 **(a)**

Let the atomic weight of X be x

mol of X_4O_6 = mol of X

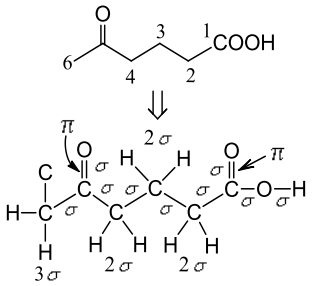
$$\Rightarrow \frac{\text{Weight of } X_4O_6}{\text{Atomic weight of } X_4O_6} = \frac{\text{Wt. of X}}{\text{At. wt. of 4X}}$$

$$\Rightarrow \frac{10}{4x + 6 \times 16} = \frac{5.72}{4x}$$

$x = 32$

4 **(a)**

$(18\sigma, 2\pi)$

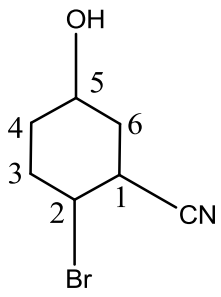


5 **(c)**

Four gram of S is in 100 gm of compound

32 gm S is in $\frac{100 \times 32}{4} = 800$ gm

6 **(b)**



Cyano group has the highest priority therefore, parent name must be benzonitrile. Br occurs at 2-position, and hydroxyl at 3-position, hence the IUPAC name is 2-bromo-5-hydroxy benzonitrile.

7 **(a)**

(a) When optically active acid reacts with racemic mixture of an alcohol, it forms two types of isomeric esters. In each, the configuration of the chiral centre of acid will remain the same.

So, the mixture will be optically active.

9 **(b)**

D.U. in (A) $= \frac{(2n_C + 2) - n_H}{2} = \frac{12 - 10}{2} = 1°$

1 D.U. suggests that either it is an alkene or a cyclopentane(C_5H_{10}). Only cyclopentane gives one product on monochlorination

So the answer is (b)

10 **(b)**

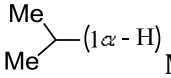
Positive charge on sp-hybridised C atom

11 **(a)**

The separation of a racemic mixture is called resolution

12 **(a)**

In $\text{Me}-(3\alpha - \text{H}) > CH_3 - CH_2 - (2\alpha - \text{H})$



$Me_3C - (\text{no } \alpha - \text{H})$

13 **(b)**

$3O_2 \rightleftharpoons 2O_3$

There is a reduction of 1 volume

When reduction in volume is 1, volume of O_3 is 2

Volume of air = 2000 ml

Volume of ozonised air = 1915 ml

Reduction in volume $= 2000 - 1915 = 85$ ml

When reduction of 1 volume, volume of $O_3 = 2$

When reduction is 85 ml , volume of $O_3 = 85 \times 2 = 170$ ml

14 **(a)**

The more the s character, the more is the penetration effect of s orbital towards the nucleus, and hence more $\bar{e}'$-withdrawing effect.

So, $sp(50\%s) > sp^2(33\%\ s) > sp^3(25\%\ s)$

16 **(c)**

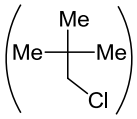
Since it is an alkane, its formula is C_nH_{2n+2}

$\therefore\ 12n + 2n + 2 = 72$

$\Rightarrow n = 5$

(A) has the molecular formula C_2H_{12}

Only (c) gives one product on monochlorination



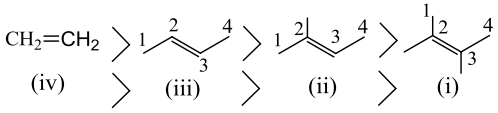
17 **(b)**

The position of Cl group has changed. So they are position isomers

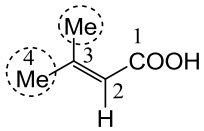
18 **(a)**

Less substituted alkene is less stable and hence more reactive

Decreasing order of reactivity



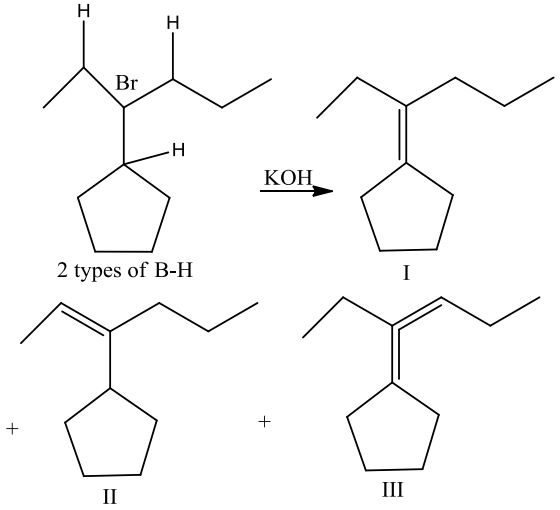
22 **(c)**



Two same groups (Me) on C-3; hence, do not show G.I.

23 **(c)**

The substrate has three different types of B − H, therefore, first, three structural isomers of alkenes are expected as



The last two alkenes II and III are also a capable of showing geometrical isomerism hence two geometrical isomers for each of them will be counted giving a total of five isomers.

24 **(b)**

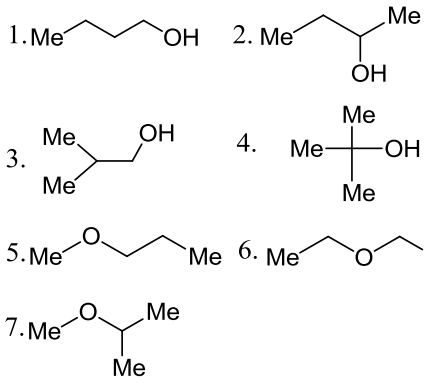
V.D. = 37, so molar mass = 74

Molecular formula = $C_4H_{10}O$

D. U. in $C_4H_{10}O = 0°$

Hence, it is an alcohol or ether

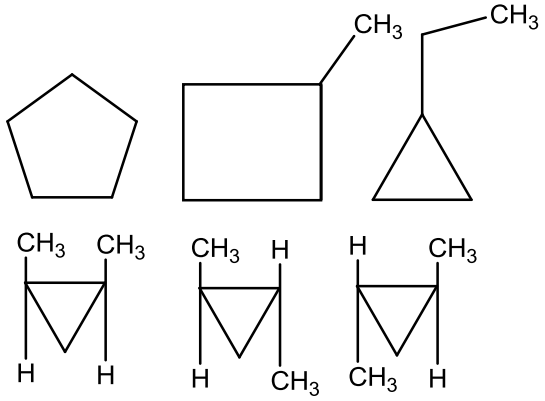
The isomers are as follows:



So, the number of isomers is 7.

25 **(c)**

The total number of cyclic isomers are six as shown below.



enantiomers

26 **(b)**

In (b), the two groups (two H atoms) are same around the double bond

28 **(c)**

The octet of all atoms are complete in structures *a* and *b*. The molecule in which all the atoms have completed octet is more stable than atom which have incomplete octet. Larger the number of resonating structures, larger will be the stability, thus structures *a* and *b* are stable.

In structure (d), the electron deficient of positive charged carbon is duly compensated by one pair electrons of adjacent oxygen atoms while such neighbour group support is not available in structure (c). Hence, structure (c) is least stable in comparison to structure (d).

30 **(a)**

C : H : N

$\frac{42.8}{12} : \frac{7.2}{1} : \frac{50}{14}$

3.56 : 7.2 : 3.57

1 : 2 : 1

EF $= CH_2N$

200 ml $= 1$ gm

22400 ml $= \frac{22400}{200} = 112$ gm

M.W. = 112 gm

E. F. W. = $CH_2N = 12 + 2 + 14 = 28$

$n = \frac{\text{M. W.}}{\text{E. F. W.}} = \frac{112}{28} = 4$

MF $= C_4H_8N_4$

31 **(a)**

Thiols(RSH) are stronger acid than alcohols Methanol ($pK_a = 15.5$) is a stronger acid than H_2O($pK_a = 15.7$), but other alcohols are weaker than H_2O. So (a) has acidic character (Table 4.3)

32 **(c)**

Aldehyde is an isomer of ketone but not of alcohol

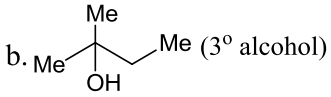
34 **(d)**

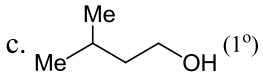
The statement is self explanatory

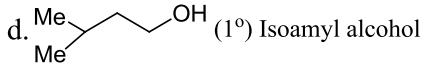
35 **(b)**

Carbinol is (MeOH)

a. $Me_3C - CH_2OH$(1° alcohol)







37 **(b)**

$C_xH_y + \left(x + \frac{y}{4}\right)O_2 \rightarrow x\,CO_2 + \frac{y}{2}H_2O$

7.5 ml $\quad 7.5\left(x + \frac{y}{4}\right)$ml $\quad 7.5x$ml−

Volume of CO_2= 15 ml

$\therefore\ 7.5x = 15, x = 2$

Volume of O_2(absorbs in pyrogallol) = 28.5 − 15= 13.5 ml

Volume of O_2(used) = 36 − 13.5 = 22.5 ml

$\therefore\ 7.5\left(x + \frac{y}{4}\right) = 12.5$

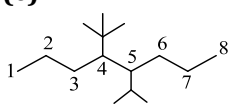
Solve for y, putting $x = 2, y = 4$

Hence formula is C_2H_4

38 **(a)**

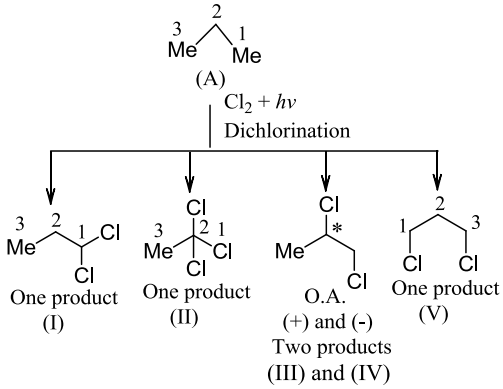
Conformation isomers are infinite

41 **(c)**



Numbering is started from that side of the chain where the complex substituent is at a lower position

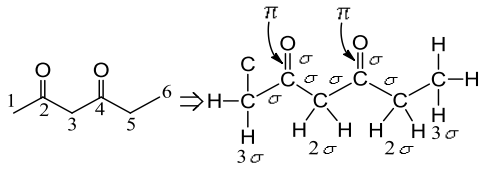
42 **(b)**



Total products on dichlorinaion of (A), i.e., numerical value of N is 5. On fractional distillation, the racemic mixture of III and IV cannot be separated but other structural isomers can be separated. So, the numerical value of M is 4 Hence the answer is 5,4(b)

43 **(b)**

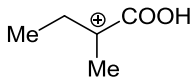
$(17\sigma, 2\pi)$



45 **(a)**

Two positive charges present at the adjacent place, elevates the energy, thus lowers the stability most.

46 **(d)**



It has an asymmetric C atom. So it is optically active

47 **(a)**

Let n mol of$(C_2H_4 + H_2)$ and x mol of C_2H_4

$H_2 = (n - x)$ mol

$C_2H_4 + H_2 \rightarrow C_2H_6$

$x \quad x \quad x$ mol

After reaction $(C_2H_6 + H_2$ left)

$x + n - x - x = n - x$

[Total H_2) = $(n - x)$, H_2reacted = x]

H_2left = $(n - x - x)$

$n = 600, \quad n - x = 400$

$\frac{n}{n - x} = \frac{600}{400}$;

$x = \frac{n}{3}$ volume of C_2H_4

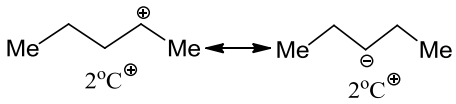
$= \frac{1}{3}$ rd of total volume

48 **(d)**

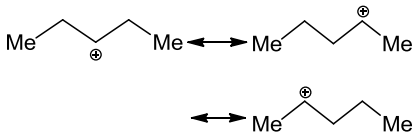
On heating the compound N_2gas is evolved which is absorbed by Cu gauge

49 **(a)**

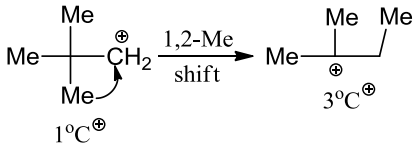
Here, (a) is stable because it would not change to other stable carbocation. It can only change 2° $C^{\oplus}$ to 2° $C^{\oplus}$

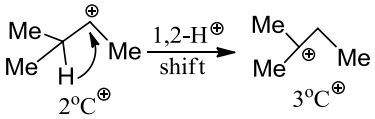


On the other hand, (b) can change to two 2° $C^{\oplus}$structures



Furthermore, (c) is stabilized by 1, 2-Me shift and (d) is stabilized by 1, 2-$H^{\oplus}$ shift





So, (a) is most stable

51 **(c)**

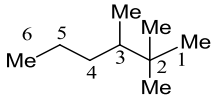
The presence of an asymmetric C atom is not essential, e.g., allenes of the type (RR'C = C = CRR') are optically active although they do not contain chiral C atoms

52 **(d)**

O atom is more EN than C atom, so it acquires $(-\delta)$ charge and C atom acquires $(+\delta)$ charge which is transferred to the last C atom

53 **(d)**

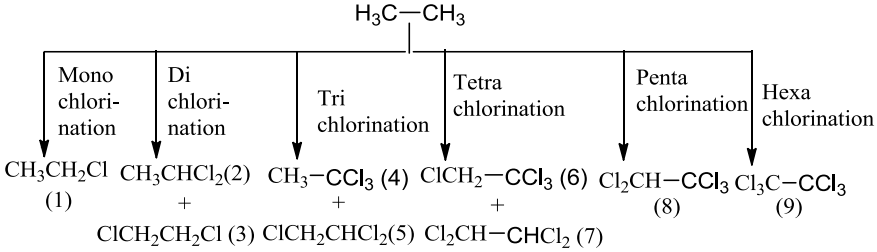
Write the structure of 2,2,3-trimethyl hexane



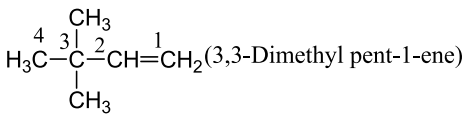
54 **(c)**

56 **(c)**

Nine halogenated products are formed

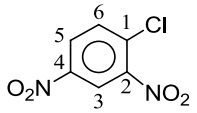


57 **(c)**



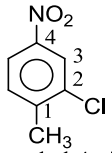
(3,3-Dimethyl pent-1-ene)

a.



1-chloro-2,4-dinitro benzene
(Lowest locant = 1 + 2 + 4 = 7)
(Correct name)
In 4-chloro-1,3-dinitro benzene
(Highest locant = 4 + 1 + 3 = 8)
(So incorrect)

b.

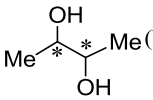


2-Chloro-1-methyl-4-nitrobenzene
(Correct name)
(Lowest locant = 2 + 1 + 4 = 7)
In 4-methyl-5-chloro-1-nitro benzene
(Highest locant = 4 + 5 + 1 = 10)
(So incorrect)

c. In (c) lowest locant is $3 + 1 + 1 = 5$

d. In (d) highest locant is $1 + 3 + 3 = 7$

55 **(b)**



(Number of asymmetric C atoms = 2)
Terminal groups are same.

Number of O.A. isomers $= 2^{n-1} = 2^{2-1} = 2^1 = 2$

Number of meso forms$= 2^{(n-2)/2} = 2^0 = 1$

58 **(b)**

$2C_xH_yN_z + 7O_2 \rightarrow 4CO_2 + 6H_2O + 2N_2$

$2x = 4 \qquad x = 2$

$2y = 12 \qquad y = 6$

$2z = 4 \qquad z = 2$

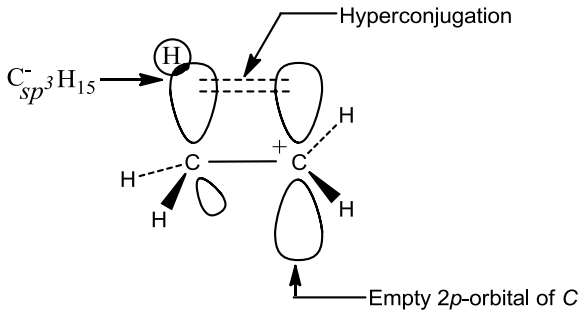
Formula = $C_2H_6N_2$

59 **(c)**

s

60 **(b)**

Hyperconjugation arises due to the partial overlap of a $sp^3 - s$ (a C-H bond) with the empty p −orbital of an adjacent positively charged carbon atom.



Hyperconjugation in ethyl cation

61 **(c)**

Volume of O_3in 100 ml of ozonised O_2
$= 100 - 90 = 10$ ml (dissolved in turpentine)
Volume of O_3 in 1 litre of ozonised $O_2 = \frac{10\times100}{100} =$ 100 ml
Volume of O_2in 1 litre $= 100 - 100 = 900$ ml
Weight of 900 ml of O_2at STP $= \frac{900\times32}{22400}$
$= 1.286$ gm
Weight of 100 ml O_3 at STP $= 1.5 - 1.286$
$= 0.214$ gm
Now, 100 ml of O_3at STP weighs $= 0.214$ gm
22400 ml of O_3at STP weighs $= \frac{0.214\times22400}{100}$
$= 47.94$ gm
Molecular weight of $O_3 = 47.94$ gm

62 **(b)**

Acidity : PhOH > CH_3SH > $MeOH$ > H_2O

Basicity: $PhO^{\ominus} < CH_3S^{\ominus} < MeO^{\ominus} < \overset{\oplus}{O}H$

(Hence the answer is b)

63 **(a)**

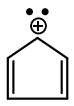
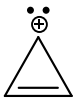
Terminal groups are different. The number of asymmetric C atoms is four

$\left(HOCH_2\overset{*}{C}H(OH)\overset{*}{C}H(OH)\overset{*}{C}H(OH)\overset{*}{C}H(OH)CH_2OH\right)$

Therefore, the number of stereoisomers (optical isomers) is
$2^n = 2^4 = 16$
(Where n is the number of asymmetrical C atoms)

64 **(b)**

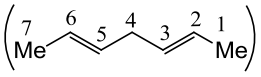
Conjugate base of I, II, and III:

(I) $HC\equiv C^{\ominus}$ (II)  (III) 

$\left(\begin{matrix}\text{Negative charge}\\ \text{on } sp \text{ C atom}\end{matrix}\right)$AromaticAnti-caromatic

Stability and acidic character: II > I > *III*

66 **(b)**



Terminal groups are same. The number of double bonds is two (even number)
∴ Number of G.I. $= 2^{n-1} + 2^{(n-2)/2} = 2^1 + 2^0 = 2 + 1 = 3$
When n is the number of double bonds

68 **(a)**

Since (A) and (B) are enantiomers, so specific rotation of B is $-52°$ (because enantiomers have equal and opposite specific rotation)

69 **(b)**

S reacts with lead chromate ($PbCrO_4$) to give a precipitate PbS

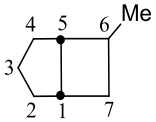
71 **(b)**

MW $= 2 \times$ V. D. $= 2 \times 30 = 60$
E. F. W. $= CH_2O = 12 + 2 + 16 = 30$
$n = \frac{\text{M. W.}}{\text{E. F. W.}} = 2$
Molecular formula = $C_2H_4O_2$

73 **(a)**

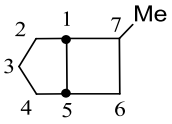
Let the volume of O_3be x ml
Volume of O_2 present $= (600 - x)$ ml
22400 ml $O_3$and O_2 at STP will weigh 48 and 32 gm, respectively
The weight of x ml of $O_3 = \frac{(x\times48)}{22400}$gm
The weight of $(600 - x)$ ml of $O_2 = \frac{(600-x)}{22400} \times 32$
The weight of ozonised O_2(600 ml) is
$$\frac{48x}{22400} + \frac{(600-x)\times32}{22400} = 1.0$$
$\therefore\ x = 200$ ml

74 **(a)**



(Correct)
Locant at C-6

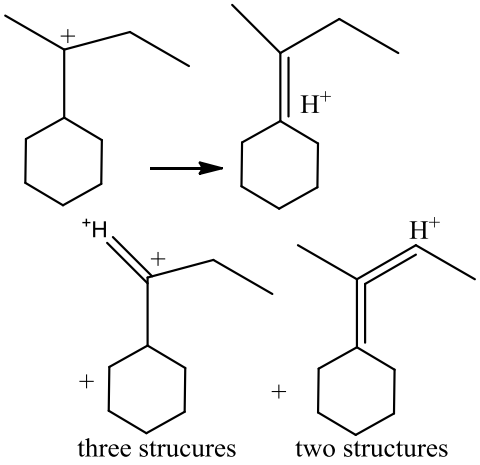
In bicyclo compounds, numbering starts from the bridge-head to the larger ring ending towards the smaller ring, following the lowest locant rule. So the correct name is 6-methyl bicyclo [3.2.0] heptane



(Incorrect)
Locant at C-7

75 **(d)**

There are total $6\alpha - H$ to sp^2 carbon and they all can participate in hyperconjugation.



three strucures two structures

77 **(a)**

2-hexyne gives *trans*-2-hexene on treatment Li/NH_3

$$CH_3 - CH_2 - CH_2 - C \equiv C - CH_3 + H_2 \xrightarrow{Li/NH_3}$$

$$CH_3 - CH_2 - CH_2 - \underset{H}{\underset{|}{C}} = \underset{H}{\underset{|}{C}} - CH_3$$

trans-2-hexene

78 **(c)**

C : H

$\frac{85.45}{12} : \frac{14.55}{1}$

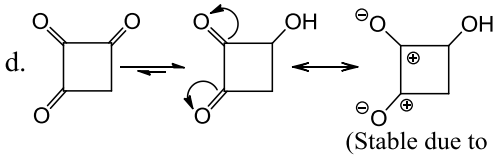
7.12 : 14.55

1:2

$EF = CH_2; MF = (CH_2)_n$

MF can be C_2H_4, C_3H_6, or C_4H_8 but not C_2H_6

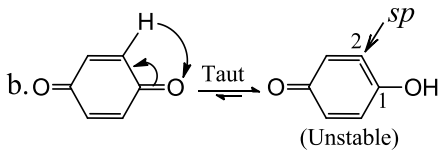
79 **(b)**



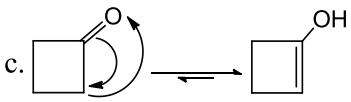
(Stable due to aromaticity)

a.

b. Does not show tautomerism



(Unstable)

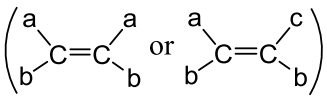


81 **(d)**

Statement (d) is wrong because resonating structures have different stabilities and, therefore, their contributions to the hybrid structures are different

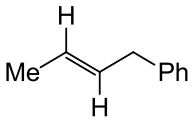
82 **(a)**

Compounds of the type



show G.I. So (a)

Shows G.I.



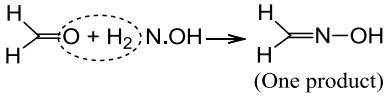
(a)

83 **(c)**

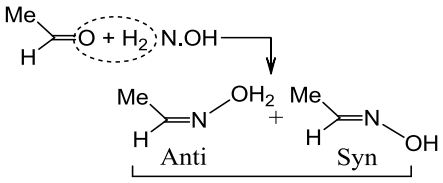
The larger the stability, the smaller the P.E.; hence I>II>III

84 **(b)**

Smallest aldehyde is ($CH_2 = O$) and the next homologue is (MeCHO)



(One product)



Two product

Total three oximes are obtained.

87 **(c)**

The symbol D denotes the relative configuration of (OH) group w.r.t. glyceraldehydes taken as standard. Also, (+) sign refers to optical rotation and is dextrorotatory

89 **(d)**

D.U. in $C_4H_{10}O = \frac{(2n_C+2)-n_H}{2} = \frac{10-10}{2} = 0$

It should be alcohol or ether

i. Alcohols and ethers are functional isomers

ii. Alcohol shows position and chain isomerism

iii. Ether shows position isomerism and metamerism

So the compound ($C_4H_{10}O$) shows chain, position,

functional isomerisms and metamerism

90 **(a)**

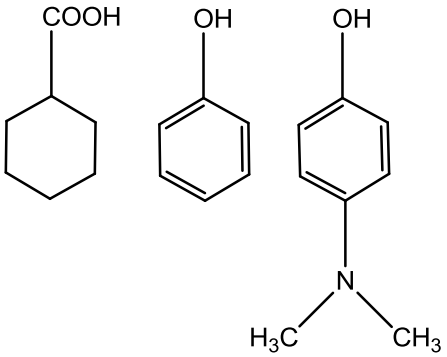
It is the test for N, S and halogens. Phosphorous is detected by another method

91 **(a)**

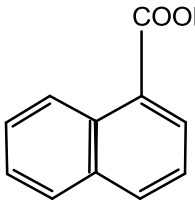
A carboxylic acid is stronger acid than phenol, hence both III and IV are stronger acids than both I and II. Also IV has a methyl group that gives electrons donating inductive effect and decreases the acid strength. Therefore, III is stronger acid than IV. Between I and II, the dominate electron withdrawing inductive effect of chlorine increases acid strength of phenol slightly, hence II is stronger of phenol slightly, hence, II is stronger acid than I.

Thus, the overall order is: (a) III>IV>II>I.

92 **(d)**



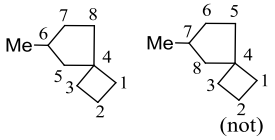
and



are soluble in aq. NaOH. Benzylic alcohol is less acidic than water so not soluble in aq. NaOH,

93 **(c)**

In spiro compounds, numbering stars from the next C atom from the single-fused point to smaller ring ending in the larger ring, following the lowest locant rule



So the correct name is 6-methyl spiro [3.4] octane

95 **(a)**

$$\text{D. U. in} C_6H_{14} = \frac{(2n_C + 2) - n_H}{2} = \frac{14 - 14}{2} = 0°$$

$$\text{D. U. in } C_4H_6 = \frac{10 - 6}{2} = 2°$$

$$\text{D. U. in } C_6H_6 = \frac{14 - 6}{2} = 4°$$

98 **(c)**

Carbanion is electron rich species. Stability of carbanion increases with increase in s −character of hybrid orbitals of carbon bearing the charge.

$\therefore \quad sp^3 \quad < sp^2 \quad < sp$

(25%s-character) (33%s-character) (50%s-character)

99 **(a)**

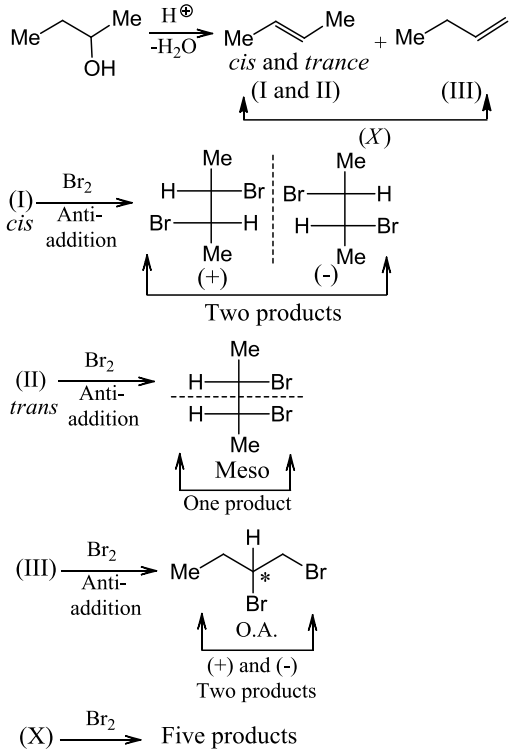
N present in the organic compound is converted into N_2 gas by heating the compound with CuO.

100 **(a)**

Ethane ($CH_3 - CH_3$) has the least hindered rotation about (C − C) bond

101 **(b)**

Three structures (I, II and III) of (X) are possible



103 **(c)**

It would give most stable 3° $C^{\oplus}$

106 **(b)**

$$C_xH_y + \left(x + \frac{y}{4}\right)O_2 \rightarrow x\,CO_2 + \frac{y}{2}H_2O$$

1 ml $\quad \left(x + \frac{y}{4}\right)$ ml $\quad x$ ml —

10 ml $\quad 10\left(x + \frac{y}{4}\right)$ml $\quad 10\,x$ ml —

Volume of $CO_2 = (70 - 50) = 20$ ml

$10x = 20$, Therefore, $x = 2$

Volume of CO_2+ Volume of O_2(left) = 70 ml

Volume of O_2(left) $= 70 - 20 = 50$ ml

Volume of O_2(used) $= 80 - 50 = 30$ ml

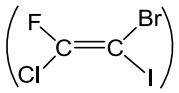
$\therefore \; 10\left(x + \frac{y}{4}\right) = 30$

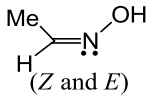
Solve for y, putting $x = 2, y = 4$

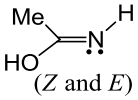
Hence the formula is C_2H_4

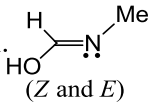
107 **(d)**

Four different groups or three different groups around the double bond give six isomers like in



i. 
(Z and E)

ii. 
(Z and E)

iii. 
(Z and E)

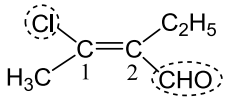
But oximes are only two as in (i), others are not oximes

108 **(a)**

Four chiral C atoms

$\overset{*}{\text{OHC}}.\overset{*}{\text{CH(OH)}}.\overset{*}{\text{CH(OH)}}.\overset{*}{\text{CH(OH)}}.\text{CH(OH)CH}_2\text{OH}$

109 **(b)**



Two higher priority groups (Cl and CHO) on C-1 and C-2 are in the opposite directions; so the configuration is E

111 **(a)**

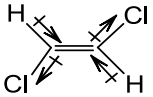
$$\text{C} : \text{H} : \text{N}$$
$$\frac{38.8}{12} : \frac{16}{1} : \frac{45.2}{14}$$
$$3.23 : 16 : 3.2$$
$$1 : 5 : 1$$
$$\text{MF} = \text{CH}_5\text{N} = \text{CH}_3\text{NH}_2$$

112 **(d)**

The mirror image of laced football is non-superimposible

116 **(b)**

The $trans$ form has zero dipole moment



The vectors due to $(\text{C} - \text{Cl})$ and $\text{C} - \text{H}$ are equal and opposite and cancel each other $(\mu = 0)$

117 **(a)**

Bond length order: $\text{C} - \text{C} > \text{C} = \text{C} > \text{C} \equiv \text{C}$

154 134 120 pm

In benzene, due to resonance, the bond length lies in between single and double bond and is 139 pm

118 **(b)**

S is converted in $\text{H}_2\text{SO}_4(\text{SO}_4^{2-})$

120 **(b)**

3° $\text{C}^{\oplus}$ is more stable

122 **(a)**

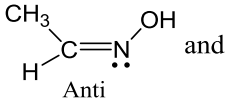
Acidic order: $sp > sp^2 > sp^3(\text{C} \equiv \text{C} > C = C > C - C)$

123 **(a)**

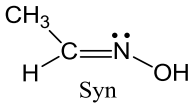
The isomers obtained due to $(\text{C} - \text{C})$ single bond rotation are called conformers

124 **(b)**

Only (b) shows G.I.


Anti
(w.r.t. H and OH)

and

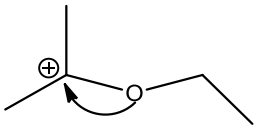

Syn
(w.r.t. H and OH)

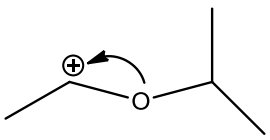
126 **(b)**

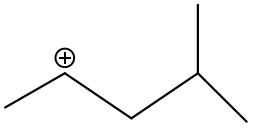
$$\text{D. U. in } \text{C}_3\text{H}_3\text{Cl}_3 = \frac{(2n_{\text{C}} + 2) - (n_{\text{Cl}} + n_{\text{H}})}{2}$$
$$= \frac{8 - 6}{2} = 1°$$
$$\text{D. U. in } \text{C}_3\text{H}_4\text{O} = \frac{(2n_{\text{C}} + 2) - n_{\text{H}}}{2} = \frac{8 - 4}{2} = 2°$$
$$\text{D. U. in } \text{C}_4\text{H}_5\text{N} = \frac{(2n_{\text{C}} + 2) - (n_{\text{H}} - n_{\text{N}})}{2}$$
$$= \frac{10 - 4}{2} = 3°$$

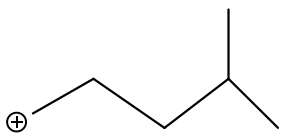
127 **(d)**

I>III>II>IV


$+M$ effect, hyperconjugation (6Hs) and $+I$ effect (2 Me-groups)

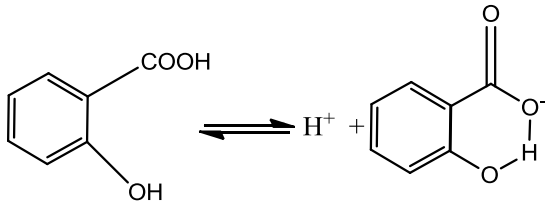

$+M$ effect, hyperconjugation (3Hs) and $+I$ effect (1-Me group)


(2^{o} carbocation) Hyperconjugation (5Hs) and $+I$ effect


(1^{o} carbocation) Hyperconjugation (2Hs) and $+I$ effect

128 **(c)**

A monosubstituted benzoic acid is stronger than a monosubstituted phenol as former being a carboxylic acid. Among the given substituted benzoic acid, $ortho-$ hydroxy acid is strongest acid although – OH causes electron donation by resonance effect which tends to decreases acid strength. It is due to very high stabilisation of conjugate base by intramolecular H-bond which outweight the electron donating resonance effect of – OH.



The overall order of acid-strength of given four acids is $ortho$-hydroxybenzoic acid (pK_a = 2.98> Toluic acid pka=4.37)$>p-$hydroxybenzoic acid
($pk_a = 4.58$) $> p-$nitrophenol ($pk_a = 7.15$).

130 **(a)**

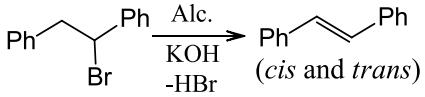
Acids and esters with same C atoms are functional isomers

132 **(c)**

The chair form of cyclohexane is most stable and hence is the least energetic conformation.

134 **(b)**

Two products



I and II

135 **(b)**

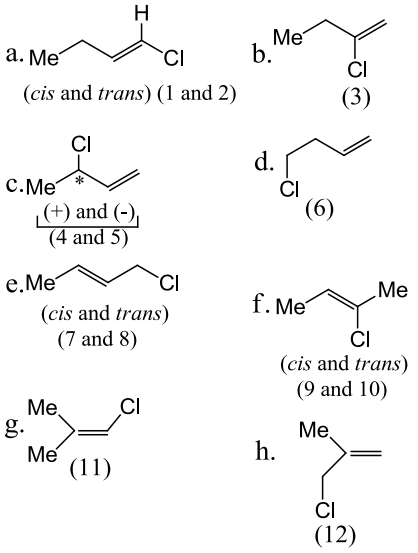
A racemic mixture is optically inactive due to the external compensation of equal percentage of $(+)$ and $(-)$ forms

136 **(a)**

$$\text{D. U. in } C_4H_7Cl = \frac{(2n_C + 2) - (n_H + n_{Cl})}{2}$$

$$= \frac{10 - 8}{2} = 1°$$

One D.U. suggests that compound contains either one $(C = C)$ bond or cyclic ring. Since acyclic isomers have been asked in the problem, the number of acyclic isomers, including stereoisomers, of C_4H_7Cl is:



Total acylic isomers including stereoisomers = 12.

138 **(b)**

The statement is self-explanatory

139 **(a)**

$$P + HNO_3 \longrightarrow H_3PO_4 \xrightarrow[(NH_4Cl+MgCl_2)]{} MgNH_4(PO_4)$$

$$\downarrow \Delta$$

$Mg_2P_2O_7$
Magnesium pyrrophosphate

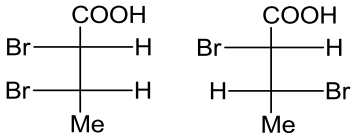
Mw of $Mg_2P_2O_7 = 24 \times 2 + 31 \times 2 + 16 \times 7 = 222$

$$\text{Percentage of P} = \frac{62}{222} \times \frac{\text{Weight of } Mg_2P_2O_7}{\text{Weight of compound}} \times 100$$

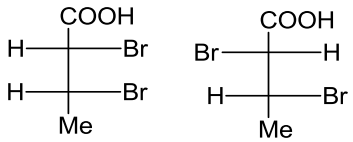
$$= \frac{62}{222} = \frac{1.0}{0.5} \times 100 = 55.85\%$$

140 **(c)**

The Fischer projection of (I) and (II) is wrong because the functional group is not at the top. On rotating (I) and (II) by 180°, they are represented as shown:



Now compare I, II, III, and IV.



(I) and (III) ⇒ Enantiomers
(II) and (IV) ⇒ Identical or same
Therefore, the pairs of diastereomers are:
(I), (II); (I), (IV); and (II), (III)
But the answer given is (C) (I,II)

141 **(c)**

C : H : O

$\frac{24}{12} : \frac{4}{1} : \frac{32}{16}$

$2 : 4 : 2$

$EF = C_2H_4O_2$

142 **(b)**

Order of enol content:

Aldehyde<Ketone<Keto-aldehyde<Diketone

(iii < ii < i < iv)

143 **(a)**

In (b), (c) and (d), carbanion is stabilised by resonance, but in (a) it is not stabilized. Moreover, (+I) effect of (Me) group destabilizes the carbanion in (a)

144 **(c)**

$2C_6H_6 + 15O_2 \rightarrow 12CO_2 + 6H_2O$

2×78 gm $\Rightarrow 15 \times 22.4$ litre of O_2 at STP

39 gm $\Rightarrow \frac{15 \times 22.4 \times 39}{2 \times 78} = 84$ litre

145 **(d)**

SN^2 reaction proceeds with the inversion of configuration; hence, only one stereoisomer is obtained

147 **(c)**

Halogens react with Ag to give AgX which reacts with $PbCrO_4$ to precipitate Ag_2CrO_4

148 **(c)**

E. F. W. = $CH_2 = 12 + 2 = 14$

$n = \frac{MW}{E.F.W.} = \frac{42}{14} = 3$

$MF = C_3H_6$

149 **(a)**

It is due to the restricted rotation around the double bond, so 2-butene shows G.I.

150 **(a)**

pK_a value of carboxylic group is less than pK_a of $\overset{+}{N}H_3$ in amino acid and $\text{——}\overset{+}{N}H_3$ (Z) will have comparatively less pK_a than $\text{——}\overset{+}{N}H_3$ (Y) due to –I effect of carboxylic group. We know that acidic strength in inversely proportional to pK_a. Hence, correct order of acidic strength is

$\text{——}CO_2H(X) > \text{——}\overset{+}{N}H_3(Z) > \text{——}\overset{+}{N}H_3(Y)$

151 **(d)**

Ethanol is a functional isomer of dimethyl ether, as both have the same molecular formula

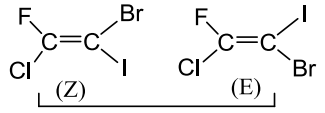
152 **(b)**

Benzyl radical is more stable than 3° radical

153 **(d)**

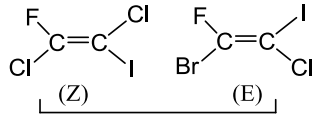
Six isomers.

Six isomers are possible.



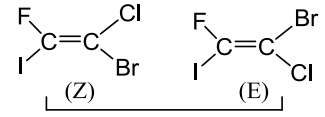
(Z) (E)

1-Bromo-2-chloro-2-fluro-1-iodo ethene



(Z) (E)

1-Bromo-2-chloro-1-fluoro-2-iodoethene



(Z) (E)

1-Bromo-1-chloro-2-fluoro-2-iodoethene

154 **(b)**

It is an example of Victor Meyer' method

$Mw = \frac{\text{Mass of compound} \times 22400}{\text{Volume of vapours at STP}}$

$= \frac{0.24 \times 22400}{45} = 119.46$

Vapour density $= \frac{Mw}{2} = \frac{119.46}{2} = 59.7$

155 **(b)**

Let B be the original base

$2B + H_2PtCl_6 \rightarrow B_2H_2PtCl_6 \xrightarrow{\Delta} Pt$

Ew of$B_2H_2PtCL_6 = 2B + 2 + 195 + 6 \times 35.5$

$= 2B + 410$

$\frac{\text{Weight of chloroplatinate}}{\text{Weight of Pt}} = \frac{\text{Eq. wt. of salt}}{\text{Eq. wt. of Pt}}$

$\frac{0.3}{0.09} = \frac{2B + 410}{195}$

B(Ew) of base = 120

Molecular weight of base= Ew × Acidity

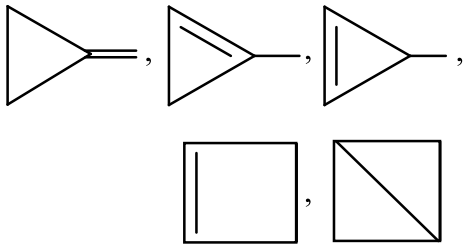
$= 120 \times 2 = 240$

156 **(d)**

Ethers and alcohols are functional isomers, so butanone (ketone) is not isomeric with diethylether

159 **(c)**

C_4H_6 can have five cyclic isomers.



160 **(c)**

Acidity as explained in (a) is : $CH_3SH > CH_3OH > H_2O >$ EtOH

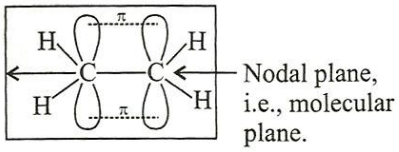
Basicity: $CH_3S^{\ominus} < CH_3\overset{\ominus}{O} < \overset{\ominus}{O}H < Et\overset{\ominus}{O}$

When nucleophilic centre is different $(CH_3S^{\ominus}$ and $CH_3\overset{\ominus}{O})$ and they belong to the same group, nucleophilicityantiparallels basicity

∴ nucleophilicity: $Et\overset{\ominus}{O} > \overset{\ominus}{O}H > CH_3S^{\ominus} > CH_3\overset{\ominus}{O}$, so the answer is (c)

161 **(a)**

A π-bond has a nodal plane passing through the two bonded nuclei, i.e., molecular plane



163 **(a)**

$(+)RCOOH + (-)R'OH \rightarrow (+)(-)RCOOR'$

Pure enantiomeric acid (O.A. alcohol) (O.A. ester)

164 **(a)**

3.4 gm S is in 100 gm of compound

32 gm of S is in $\frac{100\times32}{3.4} = 941.7 \approx 940$

165 **(a)**

Acidity : $HC \equiv H_2 > NH_3 > CH_4$

Basicity : $HC\equiv C^{\ominus} < \overset{\ominus}{H} < \overset{\ominus}{N}H_2 < \overset{\ominus}{C}H_3$

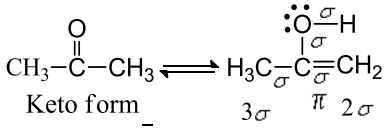
The lower the value of pK_b, the stronger is the base

The decreasing order of pK_b values:

$\overset{\ominus}{C}H_3 < \overset{\ominus}{N}H_2 < \overset{\ominus}{H} < HC\equiv C^{\ominus}$ (IV < III < II < I)

168 **(a)**

$(8\ \sigma, 1\pi, 2\ LP\bar{e}'s)$



169 **(a)**

CH_3OH is also called zerone

170 **(b)**

Although the meso compounds contain asymmetric C atoms, but they are optically inactive due to superimposable mirror image or due to the presence of any element of symmetry

171 **(a)**

Self-explanatory

173 **(b)**

$CH_3C \equiv CCH_3$ is linear and symmetrical and thus dipole moment is zero

174 **(a)**

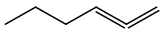
distinguish between $Br^{\ominus}$ and $I^{\ominus}$;

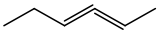
175 **(b)**

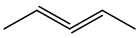
Na reacts with C, N, and S to form NaCNS (sodium thiocyanate)

176 **(d)**

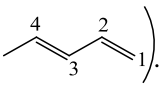
Cumulated diene is (C = C = C)

a. 

b. 

c. 

(All cumulated diene)

d. It is not a cumulated diene 

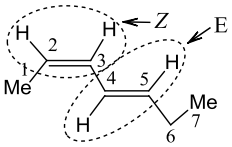
177 **(a)**

$Fe^{3+} + [Fe(CN)_6]^{4-} \rightarrow Fe_4[Fe(CN)_6]_3$

Prussian blue

(Ferri-ferrocyanide)

179 **(d)**



Hence the correct name is (d).

Hence the correct name is (d)

180 **(c)**

$CuSO_4$ or Hg acts as catalyst

181 **(d)**

mEq. of NaOH $= 12.5 \times 0.1$

$= 1.25$

mEq. of acid = mEq. of NaOH

Equivalent $= \frac{\text{Wt.}}{\text{Ew}}$

$\therefore$ EW $= \frac{\text{Wt.}}{\text{Equivalent}} = \frac{0.14}{1.25 \times 10^{-3}}$

$= 112$

182 **(a)**

III > *IV* > *II* > *I* >(III(acids)> *IV*(acid with Me)group at p-position (+I and H.C.effect of Me))> *II*(Phenol with Cl at *p*-position (−I effect of Cl))> *I* (standard)

183 **(c)**

In case of polyfunctional compounds, one of the functional groups is closen as the principal group and the compound is named on that basis. The remaining functional groups, which are subordinate functional groups, are named as substituents using the appropriate prefixes.

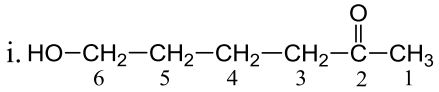
The decreasing order of priority of some functional groups is

$-COOH > -SO_3H > -COOR$ (ester)> $-COCl$ (acylhalide)> $-CONH_2$(amide)> $-C \equiv N$(nitriles)> $-CH = O$(aldehyde)> $>C=O$ (keto)> $-OH$(alcohol) > $-NH_2$(amine)>

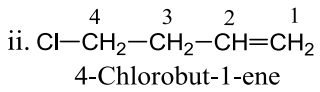
$>C=C<$ (alkene)> $-C\equiv C-$(alkyne)

The– R (alkyl group), Ph or C_6H_5- (Phenyl), halogens (F, Cl, Br, I), $-NO_2$, alkoxy($-OR$), etc., are always prefix substituents. Thus, a compound containing both an alcohol and a keto group is named hydroxyl alkanone since the keto group is preffered to the hydroxyl group

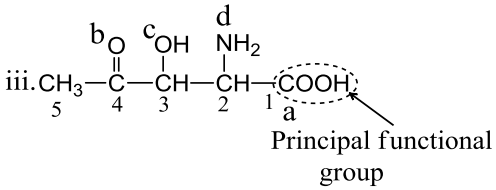
For example



6-Hydroxyhexan-2-one



4-Chlorobut-1-ene



(a, b, c, and d are in the decreasing preference order but written in **IUPAC name:**2-Amino-3-hydroxy-4-oxopentan-1-oic acid

184 **(b)**

Positive Lassiagne's test is given by containing both C and N

a. NH_2CONH_2 (Contains both C and N)

b.NH_2-NH_2 (Does not contain C). So, the test is not given by (b)

c. Glycine (NH_2-CH_2-COOH).(Contains both C and N)

d.Ph– NH— NH_2 (Contains both C and N)

185 **(c)**

The most substituted alkene is more stable. Alkene in (c) is most substituted

186 **(b)**

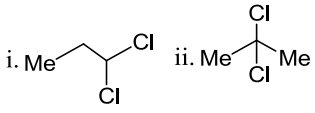
E. F. W. = $C_2H_5O = 12\times 2+5\times 16=45$

$n=\dfrac{\text{M. W.}}{\text{E. F. W.}}=2$

Molecular formula = $C_4H_{10}O_2$

187 **(b)**

Gem system, when both groups are on the same C atom



188 **(b)**

$2C_2H_6+Br_2\rightarrow 2C_2H_5Br+HBr\xrightarrow{2Na}C_4H_{10}$ 12 $\times 4+10=58$ gm

58 gm of n-butane $\Rightarrow 2\times 22.4$litre of C_2H_6at STP

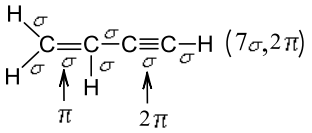
i. e., $2\times 22.4\times\dfrac{100}{85}\times\dfrac{100}{90}$

$=58.56$ litre at STP

$\therefore$ 58 gm of n-butane $=58.56$ litre

55 gm of n-butane $=55.5$ litre

189 **(b)**



$(7\sigma, 2\pi)$

192 **(a)**

Cyclopropane has the maximum angle strain

$\left(\dfrac{109°,28'-60°}{2}=24°,44'\right)$

So it is the most strained ring

193 **(b)**

Br is less reactive and more selective. Thus the formation of 3° radical will be the major product

194 **(b)**

Positive Lassiagne's test is given by containing both C and N

a. NH_2CONH_2 (Contains both C and N)

b.NH_2-NH_2 (Does not contain C). So, the test is not given by (b)

c. Glycine (NH_2-CH_2-COOH).(Contains both C and N)

d.Ph– NH— NH_2 (Contains both C and N)

195 **(a)**

Percentage of N

$=\dfrac{1.4\times \text{mEq. of } H_2SO_4 \text{ used to neutralise } NH_3}{\text{Weight of compound}}$

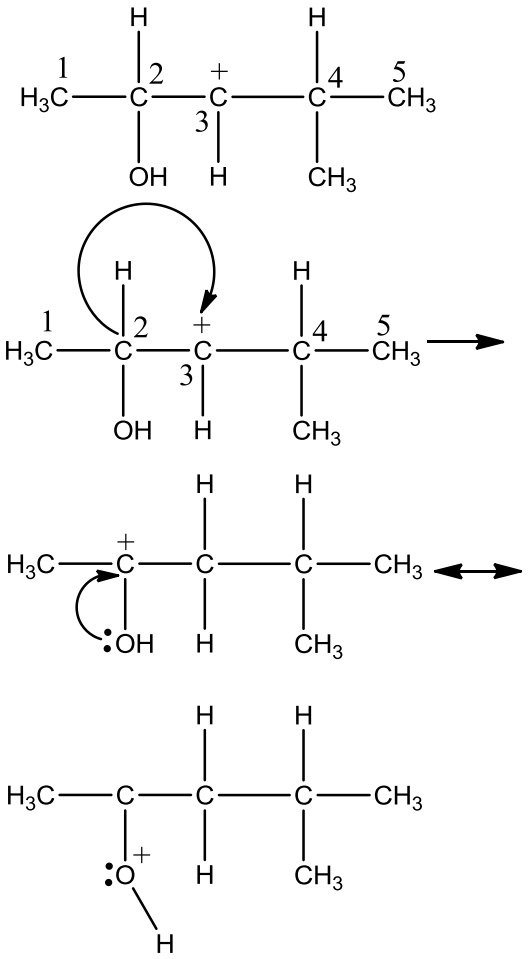
m moles of $H_2SO_4=20$

mEq. of $H_2SO_4=20\times 2=40$

Percentage of N $=\frac{1.4\times 40}{2.8}=20\%$

196 **(d)**

In the following carbocation; H/CH_3 that is most likely to migrate to the positively charged carbon is

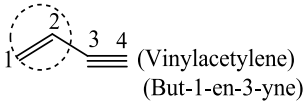


(A resonance stabilised carbocation)

197 **(c)**

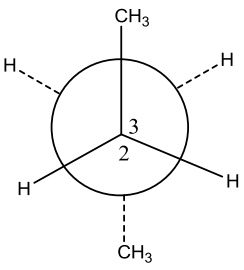
SE reactions are favoured by EDG. $CH_3$is$\bar{e}$-donating by +I effect, whereas (−Cl) is EW by – I effect, and $(-NO_2)$ is EW by – I and – R . So toluene undergoes SE reaction most readily

198 **(c)**

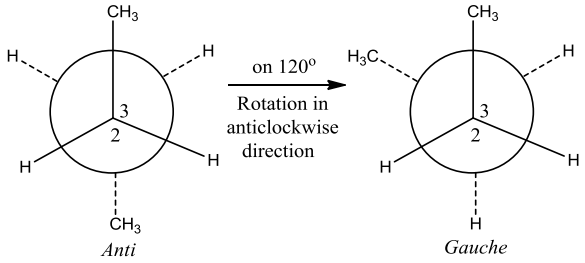


(Vinylacetylene) (But-1-en-3-yne)

199 **(c)**



Here, when C_2 is rotated anticlockwise 120° about $C_2 - C_3$ bond the resulting conformer is *Gauche* conformer. Hence,



201 **(d)**

C : H

$\frac{80}{12} : \frac{20}{1}$

6.6 : 20

1 : 3

$EF = CH_3$

$MF = C_2H_6$

202 **(c)**

C : H

$\frac{90}{12} : \frac{10}{1}$

7.5 : 10

1 : 1.3

3 : 4 (whole number)

$EF = C_3H_4$

203 **(a)**

C : H : O

$\frac{40}{12} : \frac{6.5}{1} : \frac{53.5}{16}$

3.33: 6.5 :3.34

1 :2 :1

$EF = CH_2O$

204 **(b)**

I. The principal group (−COOH) is lost

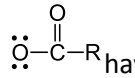
II. Same as is (I)

III. One (−COOH) group is lost, but still one (−COOH) group is left in the product

205 **(a)**

(III)+I effect of two Me groups>(IV) standard (NH_3)>(I) EWG $(C = O)$ groups> (II) EWG two $(C = O)$ groups

208 **(c,d)**

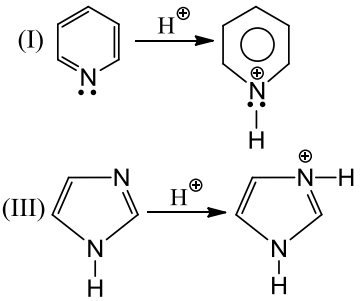
Here, $-NH_2$ and  have LP $\bar{e}'$s which can be donated to benzene ring and activate it at *o*- and *p*-position and thus are *o*- and *p*-directing

210 **(c,d)**

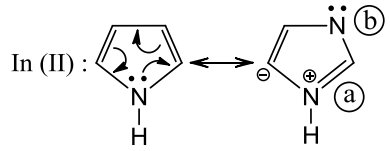
a.$\left(x + \frac{y}{4}\right) O_2$

b.$Fe_4\,[Fe(CN)_6]_3$

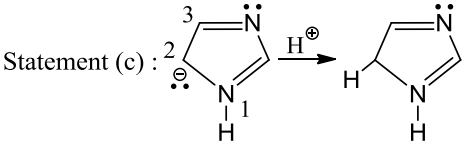
211 **(a,c,d)**



But (II) is not protonated, hence the statement (a) is true.



So, N^b is more basic due to the presence of LP e's.



Statement (c) is true

Statement (d): Due to resonsnce all the N in I,II, and III is sp^2hybridised and hence the statement is true

212 **(a)**

There is configurational similarity between L-glyceraldehyde and (−)-serine

215 **(a,b)**

a.The smaller the angle, the larger the dipole moment, so μ of I > *II* > *III*

b. (I) is 3° Allylic with conjugation

(II) is 3° Allilic

(III) 3°free radical. Hence, the order is I > *II* > *III*

c. Acidity:RSH > CH_3OH > H_2O

Basic strength: $RS^{\ominus} < CH_3O^{\ominus} < \overset{\ominus}{O}H$

d. Acidity: HI > *HBr* > *HCl* > *HF*

Basicity: $I^{\ominus} < Br^{\ominus} < Cl^{\ominus} < F^{\ominus}$

Nucleophilicity: $I^{\ominus} > Br^{\ominus} > Cl^{\ominus} > F^{\ominus}$

When nucleophilic centres are different and belong to the same group of periodic table, nucleophilicity is antiparallel to basicity

216 **(c)**

The statement is self-explanatory

217 **(b)**

It is called empirical formula

218 **(a,b,c,d)**

All statements are true and self -explanatory

220 **(a,b,c)**

d. Some coordination compounds show optical isomerism

222 **(a,b,c,d)**

a. Sometimes test fails : urea, thiourea, pyridine also gives

b. It is due to the formation of ferri-ferrocyanide$Fe_4[Fe(CN_6)]_3$

c. Blood- red colour is obtained

d. Molecular mass of an acid = Ew × basicity

223 **(b,c)**

a. Indicates the presence of Br

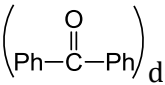
d. Victor Meyer's method is used to determine molecular mass of volatile organic compound. Dumas method is used to determine percentage of N. The molecular mass of non-volatile compound is determined by depression in freezing point or by elevation in boiling point method

224 **(c,d)**

c. Examples of functional isomerism

d. Belongs to the same class of compounds

226 **(d)**

Here, (d)  does not have α-H atom and, therefore, does not show tautomerism

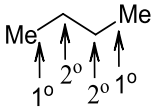
227 **(a,b,c)**

a. The general formula of alkane is C_nH_{2n+2}

b. They have different physical properties, but same chemical properties

c. International Union of Pure and Applied Chemistry

d. It is correct



231 **(c,d)**

In IV, lone pair of two N makes it more basic and does not delocalize in the benzene ring. In III, no delocalization of LP of $\bar{e}'$s on $\ddot{N}H_2$

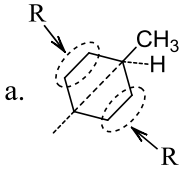
In II, no delocalization of LP of $\bar{e}'$ on N

In I, delocalization of LP of $\bar{e}'$s on N *via*resonance

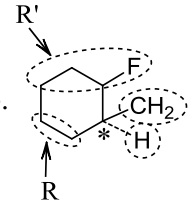
Hence, the order of basic character is

:IV > *III* > *II* > *I*

232 **(b,d)**



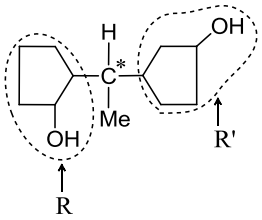
[Does not have asymmetrical C atom because two (R) groups are same

b. 

(It is optically active since it has an asymmetrical C atom. Four different groups are R, R′, CH_3, and H.)

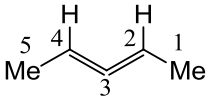
c. It is optically inactive due to the presence of diagonal plane of symmetry and alternating axis of symmetry

d. It is optically active since it has an asymmetrical C atom



(Four different groups are H, Me, R, and R'.)

233 **(c,d)**

a. 

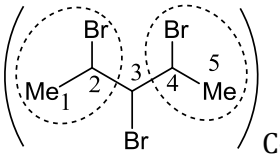
(Allenes of this type show O.I.)

b. The *cis*form shows O.I.

c. The *trans*form does not show O.I. due to the centre of symmetry

d. Does not show O.I. due to alternating axis of symmetry

235 **(b,d)**

a. It has two chiral centres, 

C-3 is not asymmetrical, since two groups around C-3 are same

b. True

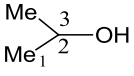
c. Have same specific rotation

d. True

239 **(c,d)**

a. It is a saturated compound

b. It contains one 4° C atom

c. 

(Propan-2-ol) (correct)

d. $CH_3^{2}\!-\!^{1}C\equiv N$ (Ethane nitrile)(correct)

242 **(a,c)**

c. Prussian blue is ferri-ferrocyanide

Turnbull's blue is ferro-ferricyanide

243 **(b)**

(a), (c), and (d) are optically inactive due to the presence of plane of symmetry

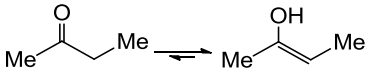
244 **(c,d)**

c. Not applicable pyridine, compounds containing $N-N$ and $N-O$ bonds, etc.

d. Estimated magnesium pyrrophosphate ($Mg_2P_2O_7$)

246 **(a,d)**

a.Butanone has α-H atom and thus shows tautomerism



b. Although meso compounds contain asymmetric C atoms, these are optically inactive due to the presence of any symmetry

c. They are called homologues

d. True

247 **(a,b,c,d)**

All statements are self explanatory

248 **(c)**


is stable (aromatic) but only in comparison to the rest of the family of anions but this is not stable as benzene (it is a neutral molecule in which all of carbon's valencies are satisfied)

Rule: Unchanged structure is more stable than a charged structure

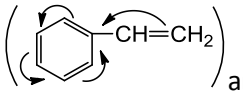
249 **(d)**

(a); (b), and (c) are true

(d) They are geometrical isomers

250 **(c,d)**

Although halogens are deactivating by $-I$effect, they are o- and p-directing due to +R effect.

$Ph-CH=CH_2$ due to electromeric effect, donates π $\bar{e}$'s to the benzene and stabilizes intermediate σ-complex 

and thus is o- and p-directing

Also, $(-CHO)$ and $(-COOH)$ do not have LP $\bar{e}$'s and thus withdraw $\bar{e}$'s from benzene ring and deactivate the ring at o- and p-position. Thus, they are m-directing

252 **(b)**

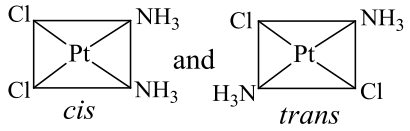
a. Cu wire is used

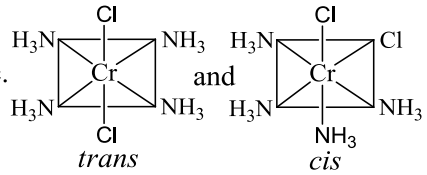
c.K_2SO_4, and $CuSO_4$ are added

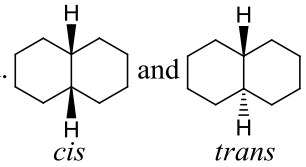
d. H is not always present

253 **(b,c,d)**

a. Does not show G.I. due to two groups (H) on the double bond

b. 

c. 

d. 

254 **(b,c)**

Both ethanol and dimethyl ether are isomers and hence contain the same percentage of carbon

256 **(d)**

$PhSO_3H + NaHCO_3 \rightarrow PhSO_3Na + CO_2 + H_2O$

$p - O_2N - C_6H_4 - OH + NaHCO_3 \rightarrow$

$p - NO_2 - C_6H_4 - ONa + CO_2 + H_2O$

257 **(a,b,c,d)**

All are self-explanatory

258 **(a,b)**

Here, (a) and (b) do not have LP $\bar{e}$'s, but (c) and (d) have $-\ddot{\underset{\cdot\cdot}{O}}R, -\ddot{\underset{\cdot\cdot}{Br}}:$.

259 **(a,b)**

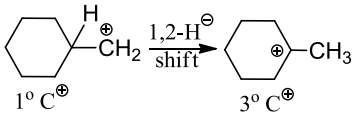
In Liebig's method a known weight of the organic compounds is heated strongly with excess of dry copper oxide in an atmosphere of air or oxygen free from moisture and CO_2

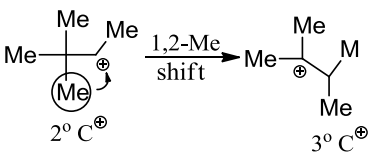
$C + 2CuO \xrightarrow{\Delta} 2Cu + CO_2$

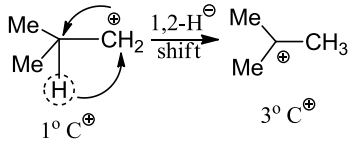
$2H + CuO \xrightarrow{\Delta} Cu + H_2O$

260 **(a,b,c)**

For spontaneous reaction, ΔG(free energy) is negative

A. 

b. 

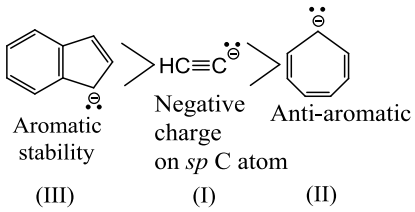
c. 

261 **(b,d)**

Groups with $+I$ effect stabilize the carbocations and groups with $-I$ effect stabilize the carbanions by dispersing the charge

265 **(b)**

The decreasing order of pK_a value :II > I > III



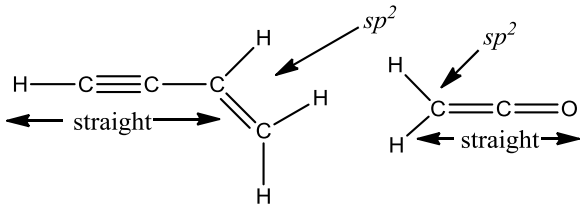
The more stable is the C_B, The stronger is the acidic strength (lower pK_a)

266 **(a,b,d)**

c. Dry CuO is used

267 **(b, c)**

In both (b) and (c), all the atoms are present in one single plane



In (a) l, 3-butadiene, conformational change is possible between $C_2 - C_3$ bond in which atoms will be present in more than on single plane.

In (b) allene, the terminals H – C – H planes are perpendicular to one another.

268 **(a,b,c)**

The process of steam distillation is used for the separation and purification of liquids which are volatile in steam

269 **(a,b,d)**

Kjeldahl's method can't be used for the estimation of nitrogen in azo compounds and compounds containing nitrogen in the ring since these compounds are not completely converted into $(NH_4)_2SO_4$ during digestion

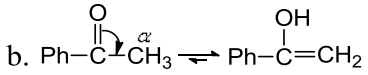
270 **(a,b,c)**

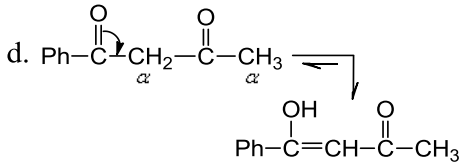
(a), (b) and (c) are self-explanatory

(d) is wrong; alkyne consists of one triple-bond

271 **(b,d)**

Tautomerism is possible in the compounds which have α-H atom, i.e., (b) and (d)

b. 

d. 

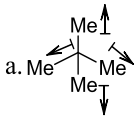
272 **(a,b,c,d)**

All statements are self-explanatory

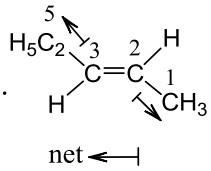
273 **(c,d)**

Charge separation structures are less important than those in which the charge is delocalized, because there is electrostatic attraction between unlike charges

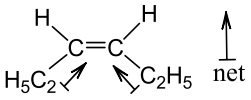
274 **(b,c)**

a. 

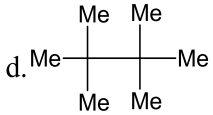
All vectors cancel each other, so $\mu = 0$

b. 

Vectors due to Me and ethyl do not cancel each other, so have net vector. Thus $\mu > 0$

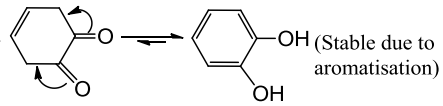
c. 

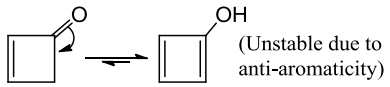
Two vectors do not cancel and give net resultant vector. So $\mu > 0$

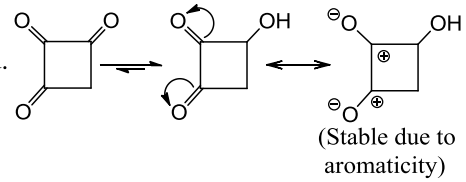
d. 

275 **(b,d)**

a. Does not show tautomerism

b. 

c. 

d. 

278 **(c,d)**

Here (c) and (d) have LP $\bar{e}'$s $-\ddot{N}H_2, -\ddot{S}R$.

280 **(a,b,c)**

a. It is the common name

b. It is a saturated compound since it does not have (C = C) or (C ≡ C) bonds

c. They are used in trivial system

d. It is correct

281 **(a,b,c,d)**

All statements are self-explanatory

284 **(a)**

Acidity: $H_2O > HC \equiv CH > NH_3 > CH_3CH_3$

Basicity : $\overset{\ominus}{O}H < HC \equiv \overset{\ominus}{C} < \overset{\ominus}{N}H_2 < CH_3\overset{\ominus}{C}H_2$

285 **(a,b,d)**

(c) Vinyl ethanoate

286 **(a,b)**

a. Both are same

b. Only those in which different groups are attached with C atom linked by double bond

c. True

d.True

287 **(b,c)**

The low reactivity of a halogen bonded to an unsaturated carbon is due to the $+M$effect of the halogen. The C − Br bond in vinyl bromide has a partial double-bond character due to the $+M$ effect of bromine, resulting in low reacticity

288 **(b,c)**

Singlet carbene, nitromethyl carbanion are planar species since the central carbon atom in each of them is sp^2-hybridised triphenylmethyl carbocation, is also in sp^2 hybrid state but it is proprller-shaped due to the repulsion between ortho hydrogens of the rings. However, in isopropyl carbanion , C is sp^3- hybridized

290 **(a,b)**

c.K_2SO_4 raises the boiling point of H_2SO_4while $CuSO_4$act as catalyst

d. Used to distinguish $Br^{\ominus}$ and$I^{\ominus}$ ions

291 **(a,b,c,d)**

All the statements are self-explanatory

292 **(a,b,c,d)**

(a) LP $\bar{e}'$s on $\ddot{P}$, (b) negative charge and three LP $\bar{e}'$s, (c) negative charge and LP $\bar{e}'$s, and (d) $H_2\ddot{O}$: LP $\bar{e}'$s

295 **(b,c)**

Glycerol is purified by vacuum distillation. Glycerol boils with decomposition at 563 K but it pressure is lowered to 12 mm. It boils at 453 K without decomposition

296 **(a)**

Both statements are correct and (R) is the correct explanation for (A). Steam distillation is used to separate volatile compounds which are insoluble in H_2O

297 **(a)**
Both (A) and (R) are correct and (R) is the correct explanation for (A),

$Cl_2 + Br^{\ominus} \rightarrow 2Cl^{\ominus} + Br_2$

$Cl_2 + I^{\ominus} \rightarrow 2Cl^{\ominus} + I_2$

Reduction potential ($E°$ $Cl_2/Cl^{\ominus}$) > $E°$ $Br_2/Br^{\ominus}$ or $E°$ $I_2/I^{\ominus}$

298 **(d)**
(A) is false. They are homologues; since the number of C atoms in pentane and 3-methyl pentane is not same, they cannot be isomers.

(R) is true

299 **(b)**
Alcohols leading to conjugated alkenes are more easily dehydrated than the alcohols leading to non-conjugated alkenes

300 **(a)**
Both (A) and (R) are correct and (R) is the correct explanation of (A). Hyperconjugation is also called Baker-Nathan effect. In (A), there are 12 α-H atoms, whereas B has only 8 α-H atoms

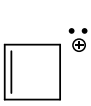
301 **(b)**
$2O_3 \rightarrow 3O_2$

2 mol $O_3 \equiv 3$ mol $O_2 = 3 \times 2$ eq O_2

$$E_O = \frac{M}{6}$$

$$= \frac{48}{6} = 8$$

302 **(a)**
Conjugate bases of (I) and (II) are:



Four e systems not in reasonce (nonaromatic)

II.

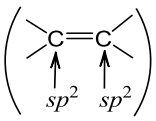
Four $\bar{e}$ aystems not in resoance (nonaomatic)

Stability and acidic order: aromatic > nonaromatic > anti-aromatic

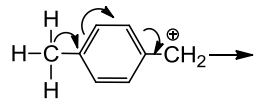
(I) is stronger acid than (II), hence (I) has lower pK_a

304 **(c)**
The stability of carbocation is explained on the basis of hyperconjugation and inductive effect hence the stability order of carbocation is
3° > 2° > 1° >Methyl carbocation

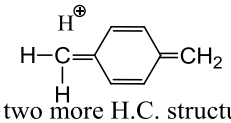
305 **(a)**
Both (A) and (R) are correct and (R) is the correct explanation for (A). As sp^2-hybridised C atoms are planar, they lie in one plane



307 **(a)**
Hyperconjugation is also called heterovalent resonance or no band resonance



Three α - H atoms



(+ two more H.C. structures.)

So (I) is more stable than (II)

308 **(c)**
(A) is correct. Simple distillation is used to separate two liquids which differ in their boiling points widely. (R) is incorrect because fractional distillation is used to separate the two liquids which differ in their boiling points by 10°C or so

309 **(a)**
Normality = molarity × n

(n =mol wt. of solute /eq. wt. of solute)

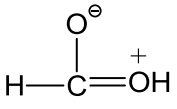
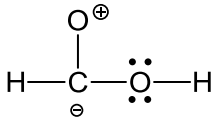
311 **(b)**
Both (A) and (R) are correct, but (R) is not the correct explanation for (A)

312 **(d)**
Electrophiles are electron deficient while nucleophiles are electron rich in nature, *ie*, electrophile can accept an electron pair while nucleophile donates an electron pair

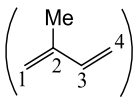
313 **(a)**
The empirical formula of compound in the simplest formula deduced from its percentage

composition showing its composition by mass

314 **(a)**
Both the structures are resonating structure of formic acid

In  negative charge is on oxygen but in  negative charge is on carbon therefore (I) will be more stable than the (II)

316 **(b)**
Isoprene is



317 **(d)**
(A) is false. They are not position isomers; since the position of the double bond has not changed, they are chain isomers.

(R) is true

318 **(b)**
Carbon in carbanion is sp^3-hybridised with one orbital occupied by a lone pair

319 **(d)**
(A) is wrong. It does not give positive test for N, since it does not contain C. So $CN^{\ominus}$ ion is not obtained which is anessential condition for the test for N. But (R) is correct

320 **(d)**
A solution; which contains one gram mole of solute per litre of solution is known as molar solution (M).

321 **(c)**
Here, $:CH_2$ has six $\bar{e}$'s and behaves as an electrophile

322 **(b)**
Both (A) and (R) are correct but (R) is not the correct explanation for (A)

323 **(d)**
$Na + \underbrace{C + N} \rightarrow NaCN$

$2Na + S \rightarrow Na_2S$

$Na + Cl \rightarrow NaCl$

$Na + Br \rightarrow NaBr$

$Na + I \rightarrow NaI$

324 **(b)**
Percentage of sulphur

$$= \frac{32}{233} \times \frac{0.35}{0.36} \times 100 = 13.35\ \%$$

325 **(d)**
Stability of carbanion is decreased by +I effect or by $\bar{e}$'-donating groups and *vice versa*

326 **(b)**
Both (A) and (R) are true, but (R) is not the correct explanation for (A)

328 **(a)**
Molality does not depend upon volume of the solution as molarity or normality. So, it does not depend upon temperature.

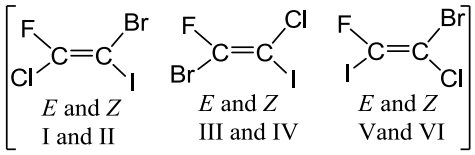
329 **(a)**
In sublimation, certain substances when heated, first directly convert from the solid to the vapour state without melting. The vapour when cooled, give back the solid substance

330 **(b)**
In Victor Mayer method, a known mass of the substance is converted into vapour by dropping in a hot tube. The vapour displaces its own volume of air which is collected over water and its volume measured at the observed temperature and pressure

331 **(c)**
All of them are self-explanatory

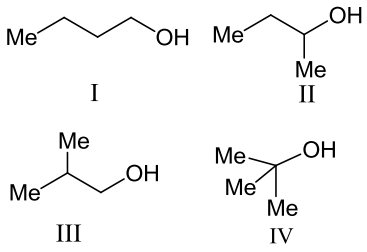
332 **(c)**
Acidic character : $d > c > e > a > b$
(d) ($-$I and$-$R of $-NO_2$)>(c)($-$I effect of Cl $-$)>(e)(Standard)>(a)(+I and H.C.effects of Me)>(b)($-$I and+R effects of $-$OMe);net$\bar{e}$-donating power is greater than that of (a)
The higher the K_a value, the stronger is the acid

333 **(a)**
(a→ r)

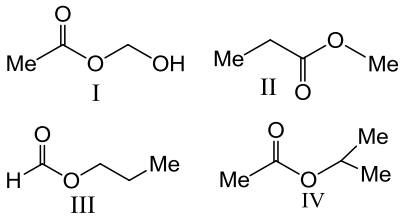


Total six geometrical isomers
(or diastereomers)

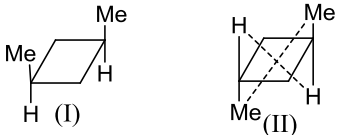
(b→p) (Four isomers)



(c→ c) (Four isomers)



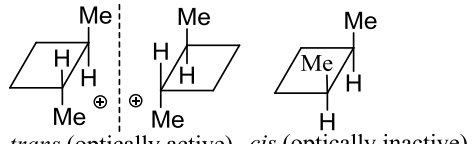
(d→s) (Two isomers)



cis (optically inactive) due to the presence of diagonal plane of symmetry

trans (O.I.A). due to the presence of centre of symmetry

(e→q) (Three isomers)

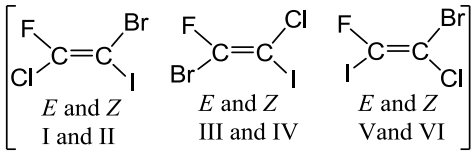


trans (optically active) I and II

cis (optically inactive) *meso* form Due to the presence of plane of symmetry. III

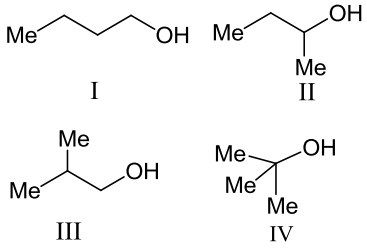
334 **(a)**

(a→ r)

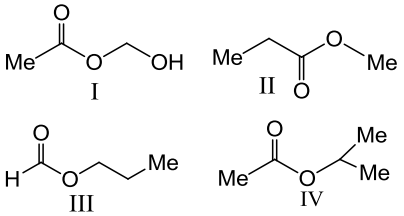


Total six geometrical isomers
(or diastereomers)

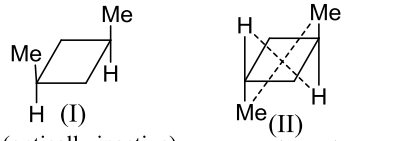
(b→p) (Four isomers)



(c→ c) (Four isomers)



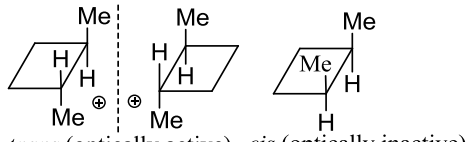
(d→s) (Two isomers)



cis (optically inactive) due to the presence of diagonal plane of symmetry

trans (O.I.A). due to the presence of centre of symmetry

(e→q) (Three isomers)



trans (optically active) I and II

cis (optically inactive) *meso* form Due to the presence of plane of symmetry. III

338 **(b)**

(a→ r) They are position isomers, not metamers. The IUPAC names are propyl-1-methanoate and propyl -2-methanoate and propyl-2-methanoate

(b→ q) Metamers

(c→ s) Acids and esters are functional isomers

(d→ r) Position isomers

(e→ p) Ring chain isomers

339 **(b)**

(a→ r) They are position isomers, not metamers. The IUPAC names are propyl-1-methanoate and propyl -2-methanoate and propyl-2-methanoate

(b→ q) Metamers

(c→ s) Acids and esters are functional isomers

(d→ r) Position isomers

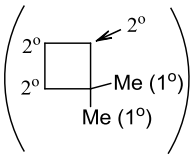
(e→ p) Ring chain isomers

340 **(a)**

(a → q) C_8H_{18}, saturated alkane

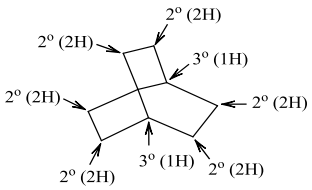
(b → r) C_6H_{12} (1 D.U. means alkene or cyclic.) It can be only (r)

(c → s) C_6H_{12} (1 D.U., cyclic)



(d → p) C_8H_{14} (1 D.U., cyclic)

2° (12H) 1° (1H)



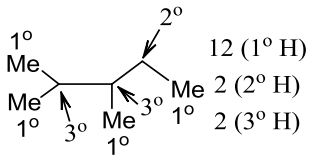
341 **(c)**

(a → r, q), (b → p), (c → s)

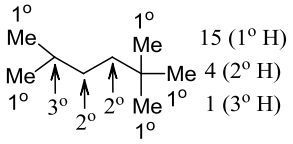
All are self-explanatory

345 **(b)**

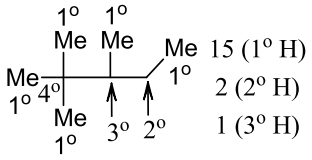
(a → r)



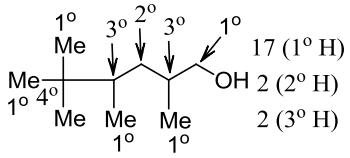
(b → p)



(c → s)



(d → q)



346 **(a)**

Sublimation conversion of solid directly into gaseous phase. The liquid state does not exist. *e*. *g*., naphthalene, anthracene.

Beilstein test simple chemical test for halogens.

Victor-Meyer's method Standard laboratory method for determining the molecular weight of a volatile liquid.

Steam distillation vaporisation of the volatile constituents of a liquid. It is special type of distillation for a temperature sensitive materials like aromatic natural compounds. *e*. *g*., *ortho* nitrophenol, cinnamaldehyde.

Vacuum distillation at reduced pressure. It is generally used in case of high boiling liquids which decompose below their normal boiling points, cannot be purified by distillation at atmospheric pressure *e*. *g*., glycerol.

Eudiometry it is the process of determining the constituents of a gaseous mixture by eudiometer. It is used for ascertaining the purity of air or amount of O_2 in it.

347 **(d)**

(a → s), (b → r)

(c→p) (Radical anion, $\dot{R}C{=}CH{-}\ddot{\overset{\ominus}{C}}{-}R$)

(d→t)

(e→p) (E 1 cB mechanism)

348 **(b)**

(**a→r**) Diazonium salts do not give positive test for N, because on heating they decompose before combining with Na to form $CN^{\ominus}$ ion, which is a necessary condition for n- test

On the other hand, it gives the test for $Br^{\ominus}$ ion (organic layer test)

(**b→s**) It contains C and S, so it gives nitroprusside test. $[Fe(CN)_5NO]^{-2}$, is nitrorpuside ion

(**c→q,r**) It contain C and N, so it gives (positive) test for N and the test for $Br^{\ominus}$

(**d→p**) It contains C and N, so it gives positive test for N and also gives test for $I^{\ominus}$ (but that is not given in the equation)

349 **(a)**

All of them are self-explanatory

350 **(d)**

(a→ r) The synthesis of chirals compounds from achiral compounds by the use of chiral reagent is called asymmetric synthesis

(b→ p) They are diastereomers

(c→ s) They are enantiomers

(d→ p) The *cis* and *trans* isomers (diastereomers)

(e→ q) Skew and anti (staggered) forms are conformational isomers

351 **(d)**

(a→ r) The synthesis of chirals compounds from achiral compounds by the use of chiral reagent is called asymmetric synthesis

(b→ p) They are diastereomers

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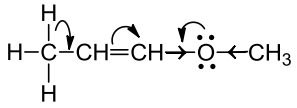
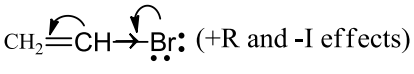
(d→ p) The *cis* and *trans* isomers (diastereomers)

(e→ q) Skew and anti (staggered) forms are conformational isomers

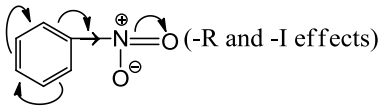
352 **(b)**



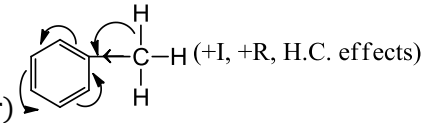
(a → p, q, r) (H.C., -I, +I, and +R effects)



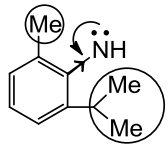
(b → p, q) (+R and -I effects)



(c → p, q) (-R and -I effects)



(d → p, q, r) (+I, +R, H.C. effects)



(a → p, q, r, s) -I, +R, Steric, and H.C. effects from *ortho*-methyl

353 **(a)**

(a→q,r) Both functional and tautomerism
(b→q,r) Both functional and tautomerism
(c→s) 3° amines to 3° amines are metamers
(d→p) Ring chain tautomerism

354 **(c)**

(a→ q) (Z); two higher priority groups Cl and I are on the same side
(b→ r) (E); Two higher priority groups Cl and I are on the opposite sides
(c→ s) (R); priority order: $-OH > -COOH > -CH_3 > H$
H is on the vertical line; sequence is clockwise and hence (R) configuration
(d→ p) (S); priority order : $-NH_2 > -COOH > Me > H$
H is on the horizontal line, with one interchange of H and Me; configuration is clockwise, so (S) configuration (odd number of interchanges)

355 **(c)**

(a→ q) (Z); two higher priority groups Cl and I are on the same side
(b→ r) (E); Two higher priority groups Cl and I are on the opposite sides
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(d→ p) (S); priority order : $-NH_2 > -COOH > Me > H$
H is on the horizontal line, with one interchange of H and Me; configuration is clockwise, so (S) configuration (odd number of interchanges)

356 **(d)**

All are self-explanatory

359 **(c)**

Toluene shows resonance due to delocalization of π-electrons

360 **(d)**

Substrate having carbonyl group on β carbon is the excellent substrate for S_N2 reaction

361 **(b)**

$$\% \text{ of chlorine} = \frac{35.5}{143.5} \times \frac{\text{wt.of AgCl}}{\text{wt.of organic compound}} \times 100$$

$$= \frac{35.5}{143.5} \times \frac{0.70}{0.35} \times 100 = 49.47\ \%$$

362 **(a)**

Empirical formula $= CH_2O$
Molecular weight $= 90$
Empirical formula weight of CH_2O
$= 12 + (1 \times 2) + 16 = 30$

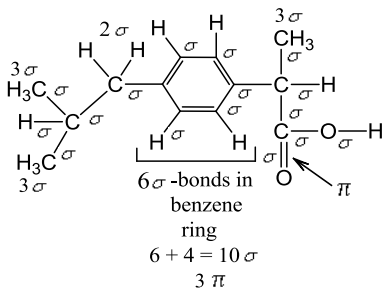
$$n = \frac{\text{molecular formula}}{\text{empirical formula weight}}$$

$$= \frac{90}{30} = 3$$

Molecular formula$= (CH_2O)_3 = C_3H_6O_3$

363 **(b)**

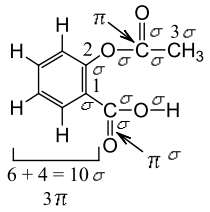
(33 σ-bonds and 4π-bonds)



364 **(b)**

(21σ-bonds and 5π-bonds)

(21σ-bonds and 5π-bonds)



366 **(c)**

Positive Lassaigne's test is given by the compound which contains both C and N. Moreover, this test is not given by diazonium compounds because they lose N_2 on heating much before they react with Na

Hence the answer is (c)

368 **(c)**

Volume of O_2 used $= \frac{400\times20}{100} = 80$ ml