Section - A (Chemistry)

51. The correct sequence of bond enthalpy of 'C–X' bond is :

(1) $CH_3-F < CH_3-Cl < CH_3-Br < CH_3-I$

(2) $CH_3-F > CH_3-Cl > CH_3-Br > CH_3-I$

(3) $CH_3-F < CH_3-Cl > CH_3-Br > CH_3-I$

(4) $CH_3-Cl > CH_3-F > CH_3-Br > CH_3-I$

52. Which one of the following methods can be used to obtain highly pure metal which is liquid at room temperature ?

(1) Electrolysis

(2) Chromatography

(3) Distillation

(4) Zone refining

53. The correct option for the number of body centred unit cells in all 14 types of Bravais lattice unit cells is :

(1) 7

(2) 5

(3) 2

(4) 3

54. Among the following alkaline earth metal halides, one which is covalent and soluble in organic solvents is :

(1) Calcium chloride

(2) Strontium chloride

(3) Magnesium chloride

(4) Beryllium chloride

55. Zr (Z = 40) and Hf (Z = 72) have similar atomic and ionic radii because of :

(1) belonging to same group

(2) diagonal relationship

(3) lanthanoid contraction

(4) having similar chemical properties

56. The maximum temperature that can be achieved in blast furnace is :

(1) upto 1200 K

(2) upto 2200 K

(3) upto 1900 K

(4) upto 5000 K

57. What is the IUPAC name of the organic compound formed in the following chemical reaction ?

$$\text{Acetone} \xrightarrow[\text{(ii) } H_2O,\ H^+]{\text{(i) } C_2H_5MgBr,\ \text{dry Ether}} \text{Product}$$

(1) 2-methyl propan-2-ol

(2) pentan-2-ol

(3) pentan-3-ol

(4) 2-methyl butan-2-ol

58. Which one of the following polymers is prepared by addition polymerisation ?

(1) Teflon

(2) Nylon-66

(3) Novolac

(4) Dacron

59. Right option for the number of tetrahedral and octahedral voids in hexagonal primitive unit cell are :

(1) 8, 4

(2) 6, 12

(3) 2, 1

(4) 12, 6

60. **Statement I :**

Acid strength increases in the order given as HF << HCl << HBr << HI.

Statement II :

As the size of the elements F, Cl, Br, I increases down the group, the bond strength of HF, HCl, HBr and HI decreases and so the acid strength increases.

In the light of the above statements, choose the **correct** answer from the options given below.

(1) Both **Statement I** and **Statement II** are true.

(2) Both **Statement I** and **Statement II** are false.

(3) **Statement I** is correct but **Statement II** is false.

(4) **Statement I** is incorrect but **Statement II** is true.

61. The **incorrect** statement among the following is :

(1) Actinoid contraction is greater for element to element than Lanthanoid contraction.

(2) Most of the trivalent Lanthanoid ions are colorless in the solid state.

(3) Lanthanoids are good conductors of heat and electricity.

(4) Actinoids are highly reactive metals, especially when finely divided.

62. The major product of the following chemical reaction is :

$$\begin{matrix}CH_3\\CH_3\end{matrix}\!\!\diagdown\!\!\diagup CH-CH=CH_2+HBr \xrightarrow{(C_6H_5CO)_2O_2} ?$$

(1) $\begin{matrix}CH_3\\CH_3\end{matrix}\!\!\diagdown\!\!\diagup CH-CH_2-CH_2-Br$

(2) $\begin{matrix}CH_3\\CH_3\end{matrix}\!\!\diagdown\!\!\diagup CH-CH_2-CH_2-O-COC_6H_5$

(3) $\begin{matrix}CH_3\\CH_3\end{matrix}\!\!\diagdown\!\!\diagup CH-\underset{\displaystyle Br}{\underset{|}{CH}}-CH_3$

(4) $\begin{matrix}CH_3\\CH_3\end{matrix}\!\!\diagdown\!\!\diagup CBr-CH_2-CH_3$

63. The structures of beryllium chloride in solid state and vapour phase, are :

(1) Chain and dimer, respectively

(2) Linear in both

(3) Dimer and Linear, respectively

(4) Chain in both

64. Given below are two statements :

Statement I :

Aspirin and Paracetamol belong to the class of narcotic analgesics.

Statement II :

Morphine and Heroin are non-narcotic analgesics.

In the light of the above statements, choose the **correct** answer from the options given below.

(1) Both **Statement I** and **Statement II** are true.

(2) Both **Statement I** and **Statement II** are false.

(3) **Statement I** is correct but **Statement II** is false.

(4) **Statement I** is incorrect but **Statement II** is true.

65. An organic compound contains 78% (by wt.) carbon and remaining percentage of hydrogen. The right option for the empirical formula of this compound is : [Atomic wt. of C is 12, H is 1]

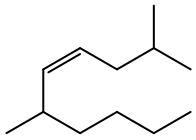
(1) CH

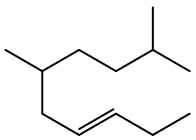
(2) CH_2

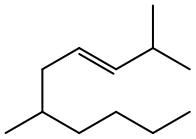
(3) CH_3

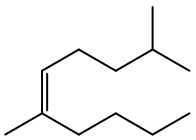
(4) CH_4

66. The correct structure of 2,6-Dimethyl-dec-4-ene is :

(1) 

(2) 

(3) 

(4) 

67. The major product formed in dehydrohalogenation reaction of 2-Bromo pentane is Pent-2-ene. This product formation is based on ?

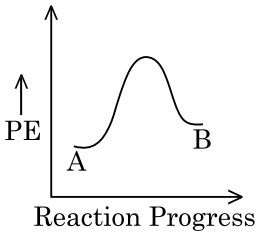
(1) Saytzeff's Rule

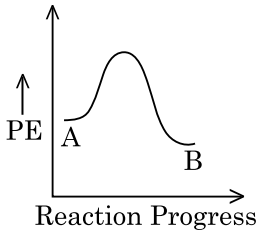
(2) Hund's Rule

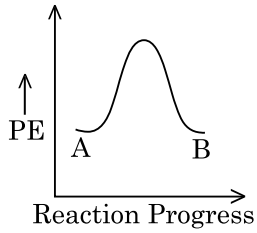
(3) Hofmann Rule

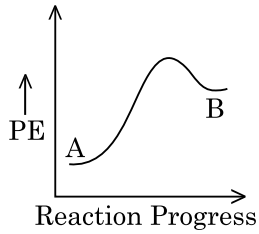
(4) Huckel's Rule

68. For a reaction A→B, enthalpy of reaction is -4.2 kJ mol^{-1} and enthalpy of activation is 9.6 kJ mol^{-1}. The correct potential energy profile for the reaction is shown in option.

(1)


(2)


(3)


(4)


69. Ethylene diaminetetraacetate (EDTA) ion is :

(1) Hexadentate ligand with four "O" and two "N" donor atoms

(2) Unidentate ligand

(3) Bidentate ligand with two "N" donor atoms

(4) Tridentate ligand with three "N" donor atoms

70. Noble gases are named because of their inertness towards reactivity. Identify an **incorrect** statement about them.

(1) Noble gases are sparingly soluble in water.

(2) Noble gases have very high melting and boiling points.

(3) Noble gases have weak dispersion forces.

(4) Noble gases have large positive values of electron gain enthalpy.

71. Which of the following reactions is the metal displacement reaction ? Choose the right option.

(1) $2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2$

(2) $Cr_2O_3 + 2Al \xrightarrow{\Delta} Al_2O_3 + 2Cr$

(3) $Fe + 2HCl \rightarrow FeCl_2 + H_2\uparrow$

(4) $2Pb(NO_3)_2 \rightarrow 2PbO + 4NO_2 + O_2\uparrow$

72. The compound which shows metamerism is :

(1) C_5H_{12}

(2) C_3H_8O

(3) C_3H_6O

(4) $C_4H_{10}O$

73. The RBC deficiency is deficiency disease of :

(1) Vitamin B_{12}

(2) Vitamin B_6

(3) Vitamin B_1

(4) Vitamin B_2

74. Dihedral angle of least stable conformer of ethane is :

(1) 120°

(2) 180°

(3) 60°

(4) 0°

75. Tritium, a radioactive isotope of hydrogen, emits which of the following particles ?

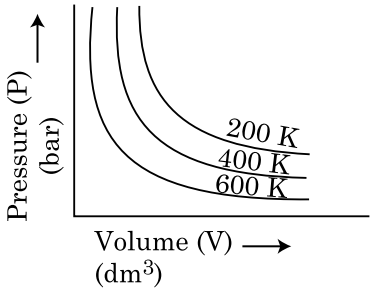
(1) Beta (β^-)

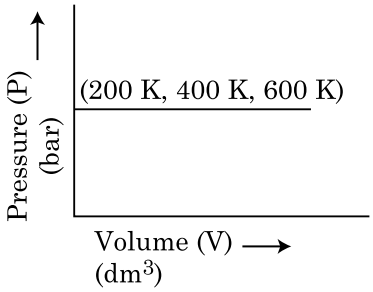
(2) Alpha (α)

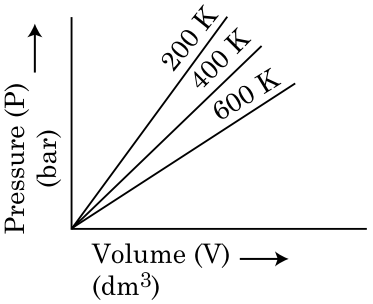
(3) Gamma (γ)

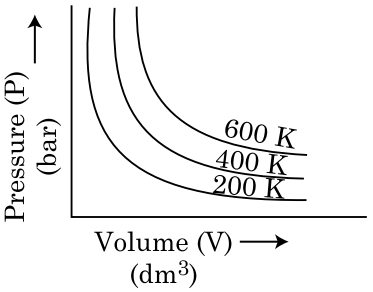
(4) Neutron (n)

76. Choose the correct option for graphical representation of Boyle's law, which shows a graph of pressure vs. volume of a gas at different temperatures :

(1)


(2)


(3)


(4)


77. The molar conductance of NaCl, HCl and CH_3COONa at infinite dilution are 126.45, 426.16 and 91.0 S cm^2 mol^{-1} respectively. The molar conductance of CH_3COOH at infinite dilution is. Choose the right option for your answer.

(1) 201.28 S cm^2 mol^{-1}
(2) 390.71 S cm^2 mol^{-1}
(3) 698.28 S cm^2 mol^{-1}
(4) 540.48 S cm^2 mol^{-1}

78. The pK_b of dimethylamine and pK_a of acetic acid are 3.27 and 4.77 respectively at T (K). The correct option for the pH of dimethylammonium acetate solution is :

(1) 8.50
(2) 5.50
(3) 7.75
(4) 6.25

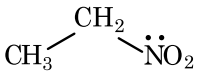
79. Match **List - I** with **List - II**.

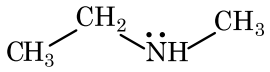
	List - I		**List - II**
(a)	PCl_5	(i)	Square pyramidal
(b)	SF_6	(ii)	Trigonal planar
(c)	BrF_5	(iii)	Octahedral
(d)	BF_3	(iv)	Trigonal bipyramidal

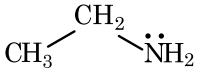
Choose the **correct** answer from the options given below.

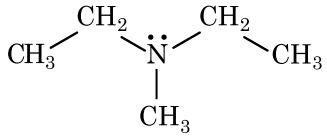
(1) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
(3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
(4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

80. Identify the compound that will react with Hinsberg's reagent to give a solid which dissolves in alkali.

(1) 

(2) 

(3) 

(4) 

81. The right option for the statement "Tyndall effect is exhibited by", is :

(1) NaCl solution
(2) Glucose solution
(3) Starch solution
(4) Urea solution

82. BF_3 is planar and electron deficient compound. Hybridization and number of electrons around the central atom, respectively are :

(1) sp^3 and 4
(2) sp^3 and 6
(3) sp^2 and 6
(4) sp^2 and 8

83. A particular station of All India Radio, New Delhi, broadcasts on a frequency of 1,368 kHz (kilohertz). The wavelength of the electromagnetic radiation emitted by the transmitter is : [speed of light, $c = 3.0 \times 10^8$ ms^{-1}]

(1) 219.3 m
(2) 219.2 m
(3) 2192 m
(4) 21.92 cm

84. Which one among the following is the correct option for right relationship between C_P and C_V for one mole of ideal gas ?

(1) $C_P + C_V = R$

(2) $C_P - C_V = R$

(3) $C_P = RC_V$

(4) $C_V = RC_P$

85. The following solutions were prepared by dissolving 10 g of glucose ($C_6H_{12}O_6$) in 250 ml of water (P_1), 10 g of urea (CH_4N_2O) in 250 ml of water (P_2) and 10 g of sucrose ($C_{12}H_{22}O_{11}$) in 250 ml of water (P_3). The right option for the decreasing order of osmotic pressure of these solutions is :

(1) $P_2 > P_1 > P_3$

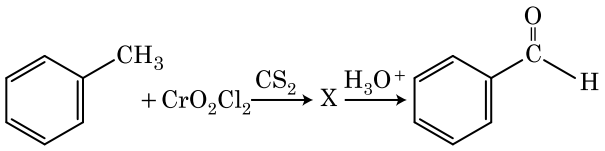
(2) $P_1 > P_2 > P_3$

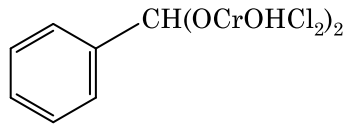
(3) $P_2 > P_3 > P_1$

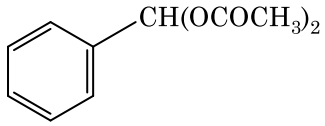
(4) $P_3 > P_1 > P_2$

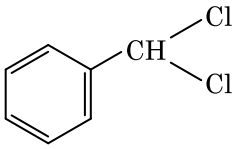
Section - B (Chemistry)

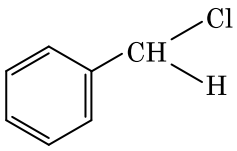
86. The intermediate compound 'X' in the following chemical reaction is :



(1) 

(2) 

(3) 

(4) 

87. For irreversible expansion of an ideal gas under isothermal condition, the correct option is :

(1) $\Delta U = 0,\ \Delta S_{total} = 0$

(2) $\Delta U \neq 0,\ \Delta S_{total} \neq 0$

(3) $\Delta U = 0,\ \Delta S_{total} \neq 0$

(4) $\Delta U \neq 0,\ \Delta S_{total} = 0$

88. Choose the correct option for the total pressure (in atm.) in a mixture of 4 g O_2 and 2 g H_2 confined in a total volume of one litre at 0°C is :

[Given $R = 0.082$ L atm $mol^{-1}K^{-1}$, $T = 273$ K]

(1) 2.518

(2) 2.602

(3) 25.18

(4) 26.02

89. The correct option for the value of vapour pressure of a solution at 45°C with benzene to octane in molar ratio 3 : 2 is :

[At 45°C vapour pressure of benzene is 280 mm Hg and that of octane is 420 mm Hg. Assume Ideal gas]

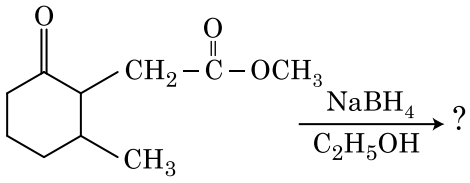
(1) 160 mm of Hg

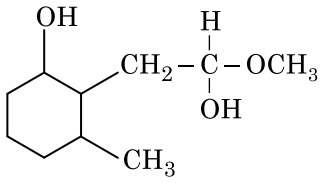
(2) 168 mm of Hg

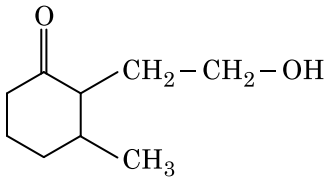
(3) 336 mm of Hg

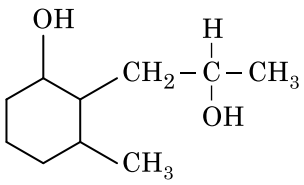
(4) 350 mm of Hg

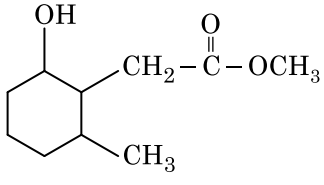
90. The product formed in the following chemical reaction is :



(1) 

(2) 

(3) 

(4) 

91. Which of the following molecules is non-polar in nature ?

(1) $POCl_3$

(2) CH_2O

(3) $SbCl_5$

(4) NO_2

92. From the following pairs of ions which one is not an iso-electronic pair ?

(1) O^{2-}, F^-

(2) Na^+, Mg^{2+}

(3) Mn^{2+}, Fe^{3+}

(4) Fe^{2+}, Mn^{2+}

93. The molar conductivity of 0.007 M acetic acid is 20 S cm^2 mol^{-1}. What is the dissociation constant of acetic acid ? Choose the correct option.

$$\left[\begin{array}{l}\Lambda^\circ_{H^+} = 350 \text{ S cm}^2 \text{ mol}^{-1} \\ \Lambda^\circ_{CH_3COO^-} = 50 \text{ S cm}^2 \text{ mol}^{-1}\end{array}\right]$$

(1) 1.75×10^{-4} mol L^{-1}

(2) 2.50×10^{-4} mol L^{-1}

(3) 1.75×10^{-5} mol L^{-1}

(4) 2.50×10^{-5} mol L^{-1}

94. The slope of Arrhenius Plot $\left(\ln k \text{ v/s } \frac{1}{T}\right)$ of first order reaction is -5×10^3 K. The value of E_a of the reaction is. Choose the correct option for your answer.

[Given $R = 8.314\ JK^{-1}mol^{-1}$]

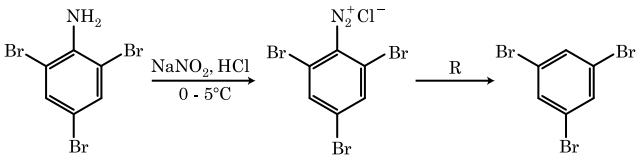
(1) 41.5 kJ mol^{-1}

(2) 83.0 kJ mol^{-1}

(3) 166 kJ mol^{-1}

(4) -83 kJ mol^{-1}

95. The reagent 'R' in the given sequence of chemical reaction is :



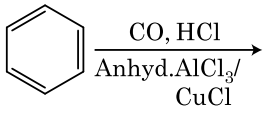
(1) H_2O

(2) CH_3CH_2OH

(3) HI

(4) CuCN/KCN

96. Match **List - I** with **List - II**.

	List - I		**List - II**
(a)		(i)	Hell-Volhard-Zelinsky reaction
(b)	$R-\overset{\overset{O}{\|}}{C}-CH_3 + NaOX \longrightarrow$	(ii)	Gattermann-Koch reaction
(c)	$R-CH_2-OH + R'COOH \xrightarrow{\text{Conc. } H_2SO_4}$	(iii)	Haloform reaction
(d)	$R-CH_2COOH \xrightarrow[\text{(ii) } H_2O]{\text{(i) } X_2/\text{Red P}}$	(iv)	Esterification

Choose the **correct** answer from the options given below.

(1) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

(2) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

(3) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

(4) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

97. Match **List - I** with **List - II**.

	List - I		**List - II**
(a)	$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$	(i)	Acid rain
(b)	$HOCl(g) \xrightarrow{h\nu} \dot{O}H + \dot{C}l$	(ii)	Smog
(c)	$CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$	(iii)	Ozone depletion
(d)	$NO_2(g) \xrightarrow{h\nu} NO(g) + O(g)$	(iv)	Tropospheric pollution

Choose the **correct** answer from the options given below.

(1) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

(2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

(3) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

(4) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

98. $CH_3CH_2COO^-Na^+ \xrightarrow[\text{Heat}]{NaOH, + ?} CH_3CH_3 + Na_2CO_3$.

Consider the above reaction and identify the missing reagent/chemical.

(1) B_2H_6

(2) Red Phosphorus

(3) CaO

(4) DIBAL-H

99. Match **List - I** with **List - II**.

	List - I		**List - II**
(a)	$[Fe(CN)_6]^{3-}$	(i)	5.92 BM
(b)	$[Fe(H_2O)_6]^{3+}$	(ii)	0 BM
(c)	$[Fe(CN)_6]^{4-}$	(iii)	4.90 BM
(d)	$[Fe(H_2O)_6]^{2+}$	(iv)	1.73 BM

Choose the **correct** answer from the options given below.

(1) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)

(2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

(3) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

(4) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

100. In which one of the following arrangements the given sequence is not strictly according to the properties indicated against it ?

(1)	$HF < HCl < HBr < HI$	:	Increasing acidic strength
(2)	$H_2O < H_2S < H_2Se < H_2Te$	:	Increasing pK_a values
(3)	$NH_3 < PH_3 < AsH_3 < SbH_3$	:	Increasing acidic character
(4)	$CO_2 < SiO_2 < SnO_2 < PbO_2$	:	Increasing oxidizing power