

Section - A (Chemistry)

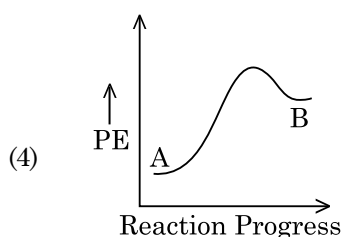
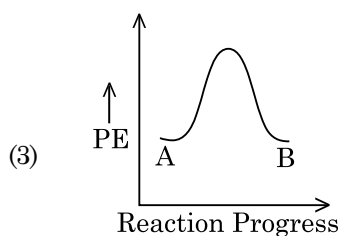
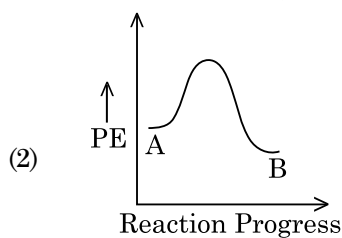
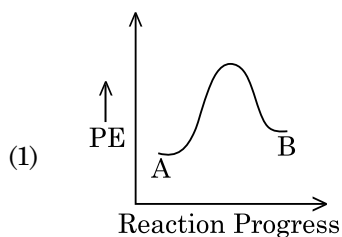
51. Right option for the number of tetrahedral and octahedral voids in hexagonal primitive unit cell are :

- (1) 8, 4
- (2) 6, 12
- (3) 2, 1
- (4) 12, 6

52. 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

53. For a reaction $A \rightarrow B$, 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.



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

- (1) Beta (β^-)
- (2) Alpha (α)
- (3) Gamma (γ)
- (4) Neutron (n)

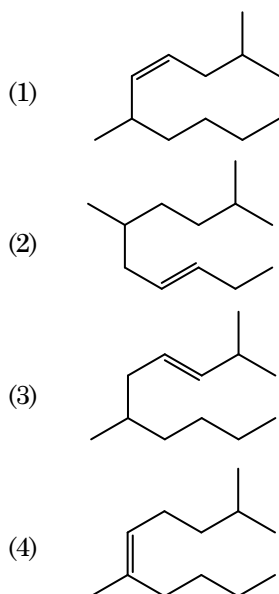
55. The RBC deficiency is deficiency disease of :

- (1) Vitamin B_{12}
- (2) Vitamin B_6
- (3) Vitamin B_1
- (4) Vitamin B_2

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

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

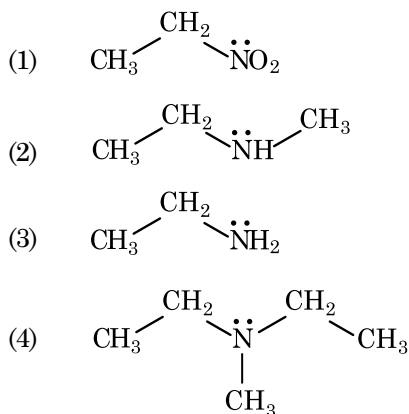
57. The correct structure of 2,6-Dimethyl-dec-4-ene is :



58. 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

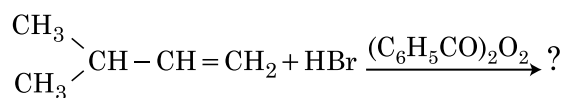
59. Identify the compound that will react with Hinsberg's reagent to give a solid which dissolves in alkali.



60. 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) $P_3 > P_1 > P_2$

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



- (1)
- (2)
- (3)
- (4)

62. 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.

63. The correct sequence of bond enthalpy of 'C-X' bond is :

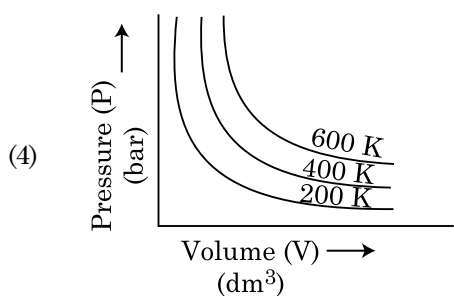
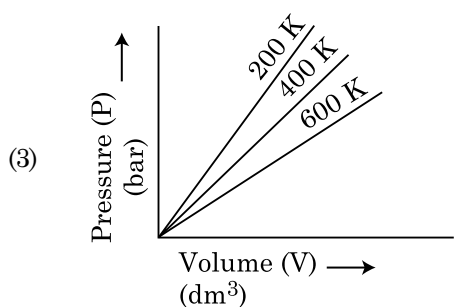
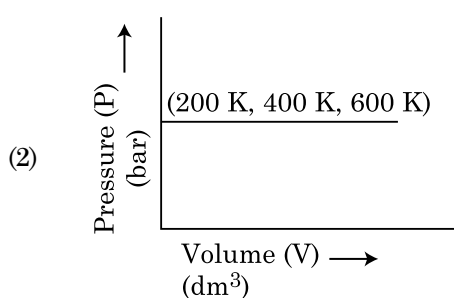
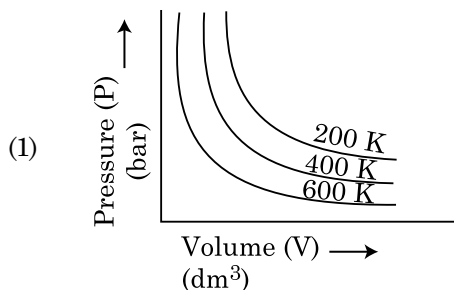
- (1) $\text{CH}_3 - \text{F} < \text{CH}_3 - \text{Cl} < \text{CH}_3 - \text{Br} < \text{CH}_3 - \text{I}$
 (2) $\text{CH}_3 - \text{F} > \text{CH}_3 - \text{Cl} > \text{CH}_3 - \text{Br} > \text{CH}_3 - \text{I}$
 (3) $\text{CH}_3 - \text{F} < \text{CH}_3 - \text{Cl} > \text{CH}_3 - \text{Br} > \text{CH}_3 - \text{I}$
 (4) $\text{CH}_3 - \text{Cl} > \text{CH}_3 - \text{F} > \text{CH}_3 - \text{Br} > \text{CH}_3 - \text{I}$

64. 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

65. Which one among the following is the correct option for right relationship between C_P and C_V for one mole of ideal gas ?
- $C_P + C_V = R$
 - $C_P - C_V = R$
 - $C_P = RC_V$
 - $C_V = RC_P$
66. Among the following alkaline earth metal halides, one which is covalent and soluble in organic solvents is :
- Calcium chloride
 - Strontium chloride
 - Magnesium chloride
 - Beryllium chloride
67. 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]
- CH
 - CH₂
 - CH₃
 - CH₄
68. The major product formed in dehydrohalogenation reaction of 2-Bromo pentane is Pent-2-ene. This product formation is based on ?
- Saytzeff's Rule
 - Hund's Rule
 - Hofmann Rule
 - Huckel's Rule
69. What is the IUPAC name of the organic compound formed in the following chemical reaction ?
- Acetone $\xrightarrow[\text{(ii) } H_2O, H^+]{\text{(i) } C_2H_5MgBr, \text{ dry Ether}}$ Product
- 2-methyl propan-2-ol
 - pentan-2-ol
 - pentan-3-ol
 - 2-methyl butan-2-ol
70. Noble gases are named because of their inertness towards reactivity. Identify an **incorrect** statement about them.
- Noble gases are sparingly soluble in water.
 - Noble gases have very high melting and boiling points.
 - Noble gases have weak dispersion forces.
 - Noble gases have large positive values of electron gain enthalpy.
71. 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 :
- 8.50
 - 5.50
 - 7.75
 - 6.25
72. The right option for the statement "Tyndall effect is exhibited by", is :
- NaCl solution
 - Glucose solution
 - Starch solution
 - Urea solution
73. **Statement I :**
- Acid strength increases in the order given as $HF \ll HCl \ll HBr \ll HI$.
- 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.
- Both **Statement I** and **Statement II** are true.
 - Both **Statement I** and **Statement II** are false.
 - Statement I** is correct but **Statement II** is false.
 - Statement I** is incorrect but **Statement II** is true.
74. Ethylene diaminetetraacetate (EDTA) ion is :
- Hexadentate ligand with four "O" and two "N" donor atoms
 - Unidentate ligand
 - Bidentate ligand with two "N" donor atoms
 - Tridentate ligand with three "N" donor atoms

75. 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 :



76. 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

77. 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

78. The compound which shows metamerism is :

- (1) C_5H_{12}
- (2) C_3H_8O
- (3) C_3H_6O
- (4) $C_4H_{10}O$

79. 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

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

- (1) Teflon
- (2) Nylon-66
- (3) Novolac
- (4) Dacron

81. 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, $c = 3.0 \times 10^8 \text{ ms}^{-1}$]

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

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

- (1) $2\text{KClO}_3 \xrightarrow{\Delta} 2\text{KCl} + 3\text{O}_2$
- (2) $\text{Cr}_2\text{O}_3 + 2\text{Al} \xrightarrow{\Delta} \text{Al}_2\text{O}_3 + 2\text{Cr}$
- (3) $\text{Fe} + 2\text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2\uparrow$
- (4) $2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2\uparrow$

83. 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.

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

- (1) 120°
- (2) 180°
- (3) 60°
- (4) 0°

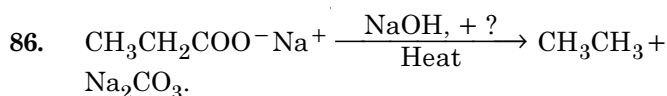
85. Match List - I with List - II.

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)

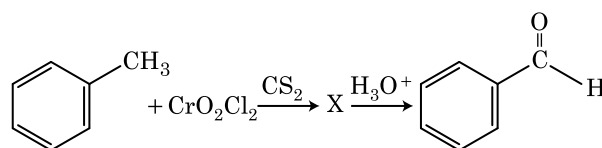
Section - B (Chemistry)



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

- (1) B_2H_6
- (2) Red Phosphorus
- (3) CaO
- (4) DIBAL-H

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



- (1)
- (2)
- (3)
- (4)


88. Match List - I with List - II.

List - I	List - II
(a) $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$	(i) Acid rain
(b) $\text{HOCl}(\text{g}) \xrightarrow{h\nu} \text{OH} + \text{Cl}$	(ii) Smog
(c) $\text{CaCO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + \text{H}_2\text{O} + \text{CO}_2$	(iii) Ozone depletion
(d) $\text{NO}_2(\text{g}) \xrightarrow{h\nu} \text{NO}(\text{g}) + \text{O}(\text{g})$	(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)

89. Match List - I with List - II.

- | List - I | List - II |
|--|------------------------------------|
| (a)  $\xrightarrow[\text{Anhyd. AlCl}_3/\text{CuCl}]{\text{CO, HCl}}$ | (i) Hell-Volhard-Zelinsky reaction |
| (b) $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 + \text{NaOX} \longrightarrow$ | (ii) Gattermann-Koch reaction |
| (c) $\text{R}-\text{CH}_2-\text{OH} + \text{R}'\text{COOH} \xrightarrow{\text{Conc. H}_2\text{SO}_4}$ | (iii) Haloform reaction |
| (d) $\text{R}-\text{CH}_2\text{COOH} \xrightarrow[\text{(ii) H}_2\text{O}]{\text{(i) X}_2/\text{Red P}}$ | (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)

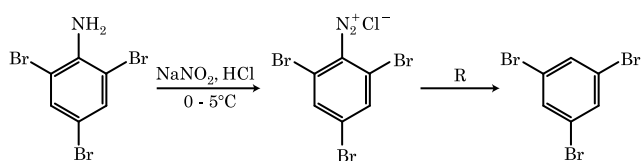
90. Match List - I with List - II.

- | List - I | List - II |
|--|---------------|
| (a) $[\text{Fe}(\text{CN})_6]^{3-}$ | (i) 5.92 BM |
| (b) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ | (ii) 0 BM |
| (c) $[\text{Fe}(\text{CN})_6]^{4-}$ | (iii) 4.90 BM |
| (d) $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ | (iv) 1.73 BM |

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

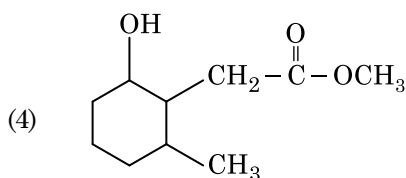
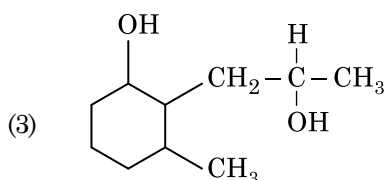
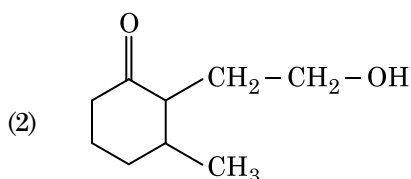
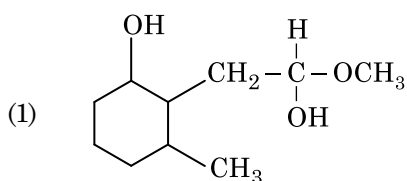
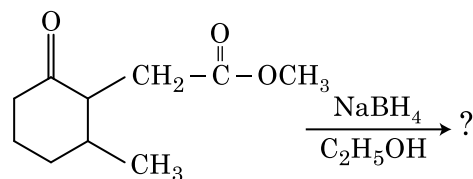
- (1) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
- (2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
- (3) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)
- (4) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

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



- (1) H_2O
- (2) $\text{CH}_3\text{CH}_2\text{OH}$
- (3) HI
- (4) CuCN/KCN

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



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

- (1) $\text{O}^{2-}, \text{F}^-$
- (2) $\text{Na}^+, \text{Mg}^{2+}$
- (3) $\text{Mn}^{2+}, \text{Fe}^{3+}$
- (4) $\text{Fe}^{2+}, \text{Mn}^{2+}$

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

$$\left[\begin{array}{l} \Lambda_{\text{H}^+}^\circ = 350 \text{ S cm}^2 \text{ mol}^{-1} \\ \Lambda_{\text{CH}_3\text{COO}^-}^\circ = 50 \text{ S cm}^2 \text{ mol}^{-1} \end{array} \right]$$

- (1) $1.75 \times 10^{-4} \text{ mol L}^{-1}$
- (2) $2.50 \times 10^{-4} \text{ mol L}^{-1}$
- (3) $1.75 \times 10^{-5} \text{ mol L}^{-1}$
- (4) $2.50 \times 10^{-5} \text{ mol L}^{-1}$

95. 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 $0^\circ C$ is :
[Given $R = 0.082 \text{ L atm mol}^{-1} K^{-1}$, $T = 273 \text{ K}$]
- (1) 2.518
 - (2) 2.602
 - (3) 25.18
 - (4) 26.02
96. The correct option for the value of vapour pressure of a solution at $45^\circ C$ with benzene to octane in molar ratio 3 : 2 is :
[At $45^\circ C$ 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
97. For irreversible expansion of an ideal gas under isothermal condition, the correct option is :
- (1) $\Delta U = 0$, $\Delta S_{\text{total}} = 0$
 - (2) $\Delta U \neq 0$, $\Delta S_{\text{total}} \neq 0$
 - (3) $\Delta U = 0$, $\Delta S_{\text{total}} \neq 0$
 - (4) $\Delta U \neq 0$, $\Delta S_{\text{total}} = 0$
98. Which of the following molecules is non-polar in nature ?
- (1) $POCl_3$
 - (2) CH_2O
 - (3) $SbCl_5$
 - (4) NO_2
99. 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
100. The slope of Arrhenius Plot $\left(\ln k \text{ v/s } \frac{1}{T} \right)$ of first order reaction is $-5 \times 10^3 \text{ K}$. The value of E_a of the reaction is. Choose the correct option for your answer.
[Given $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$]
- (1) 41.5 kJ mol^{-1}
 - (2) 83.0 kJ mol^{-1}
 - (3) 166 kJ mol^{-1}
 - (4) -83 kJ mol^{-1}