

**Section - A (Chemistry)**

51. 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)  $C_V = RC_P$
52. 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
53. 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.
54. 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
55. The compound which shows metamerism is :
- (1)  $C_5H_{12}$
  - (2)  $C_3H_8O$
  - (3)  $C_3H_6O$
  - (4)  $C_4H_{10}O$
56.  $BF_3$  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
57. The right option for the statement "Tyndall effect is exhibited by", is :
- (1) NaCl solution
  - (2) Glucose solution
  - (3) Starch solution
  - (4) Urea solution

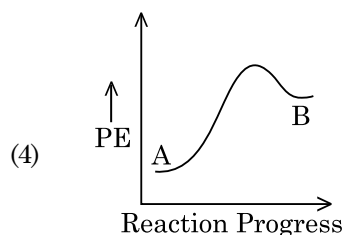
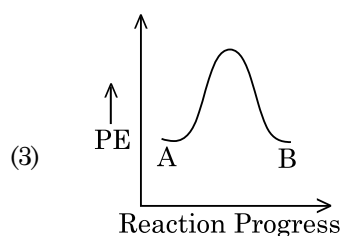
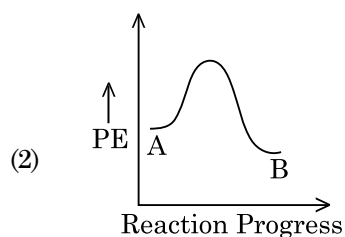
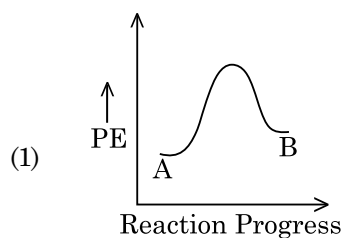
58. Among the following alkaline earth metal halides, one which is covalent and soluble in organic solvents is :

- (1) Calcium chloride
- (2) Strontium chloride
- (3) Magnesium chloride
- (4) Beryllium chloride

59. 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

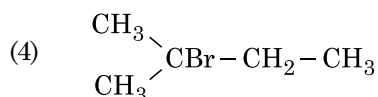
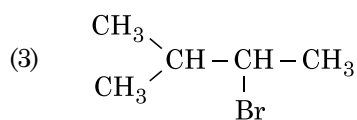
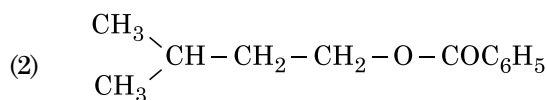
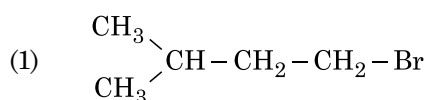
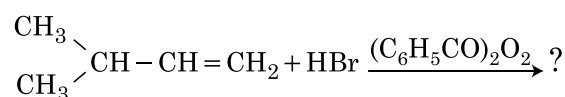
60. For a reaction  $A \rightarrow B$ , enthalpy of reaction is  $-4.2 \text{ kJ mol}^{-1}$  and enthalpy of activation is  $9.6 \text{ kJ mol}^{-1}$ . The correct potential energy profile for the reaction is shown in option.



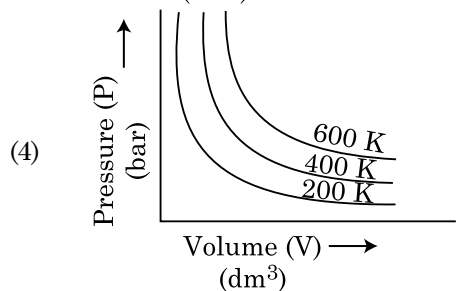
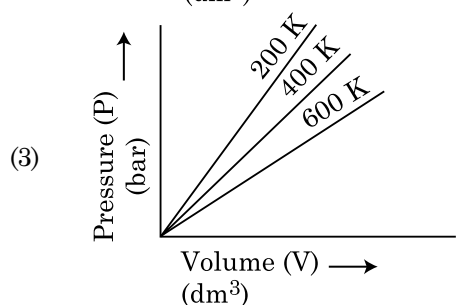
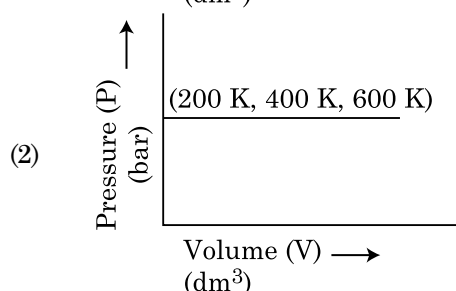
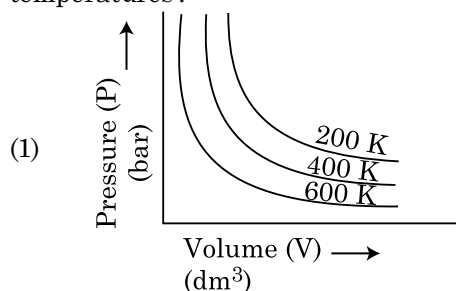
61. Which one of the following polymers is prepared by addition polymerisation ?

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

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



63. 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 :



64. Dihedral angle of least stable conformer of ethane is :
- (1)  $120^\circ$
  - (2)  $180^\circ$
  - (3)  $60^\circ$
  - (4)  $0^\circ$
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<sub>2</sub>
  - (3) CH<sub>3</sub>
  - (4) CH<sub>4</sub>

66. 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
67. The following solutions were prepared by dissolving 10 g of glucose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>) in 250 ml of water (P<sub>1</sub>), 10 g of urea (CH<sub>4</sub>N<sub>2</sub>O) in 250 ml of water (P<sub>2</sub>) and 10 g of sucrose (C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>) in 250 ml of water (P<sub>3</sub>). The right option for the decreasing order of osmotic pressure of these solutions is :
- (1) P<sub>2</sub> > P<sub>1</sub> > P<sub>3</sub>
  - (2) P<sub>1</sub> > P<sub>2</sub> > P<sub>3</sub>
  - (3) P<sub>2</sub> > P<sub>3</sub> > P<sub>1</sub>
  - (4) P<sub>3</sub> > P<sub>1</sub> > P<sub>2</sub>
68. 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
69. The molar conductance of NaCl, HCl and CH<sub>3</sub>COONa at infinite dilution are 126.45, 426.16 and 91.0 S cm<sup>2</sup> mol<sup>-1</sup> respectively. The molar conductance of CH<sub>3</sub>COOH at infinite dilution is. Choose the right option for your answer.
- (1) 201.28 S cm<sup>2</sup> mol<sup>-1</sup>
  - (2) 390.71 S cm<sup>2</sup> mol<sup>-1</sup>
  - (3) 698.28 S cm<sup>2</sup> mol<sup>-1</sup>
  - (4) 540.48 S cm<sup>2</sup> mol<sup>-1</sup>
70. 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
71. 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 × 10<sup>8</sup> ms<sup>-1</sup>]
- (1) 219.3 m
  - (2) 219.2 m
  - (3) 2192 m
  - (4) 21.92 cm
72. 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

73. 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)  $\text{CH}_3-\text{Cl} > \text{CH}_3-\text{F} > \text{CH}_3-\text{Br} > \text{CH}_3-\text{I}$

74. The  $\text{pK}_b$  of dimethylamine and  $\text{pK}_a$  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

75. 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

76. 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.

77. Match List - I with List - II.

- | List - I           | List - II                 |
|--------------------|---------------------------|
| (a) $\text{PCl}_5$ | (i) Square pyramidal      |
| (b) $\text{SF}_6$  | (ii) Trigonal planar      |
| (c) $\text{BrF}_5$ | (iii) Octahedral          |
| (d) $\text{BF}_3$  | (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)

78. **Statement I :**

Acid strength increases in the order given as  $\text{HF} \ll \text{HCl} \ll \text{HBr} \ll \text{HI}$ .

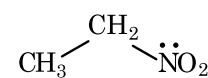
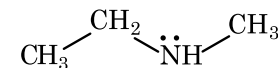
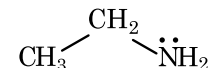
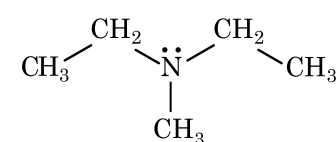
**Statement II :**

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.

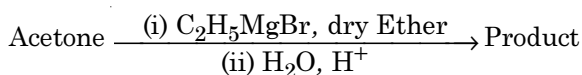
In the light of the above statements, choose the **correct** answer from the options given below.

- (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.

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

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

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

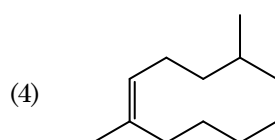
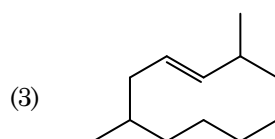
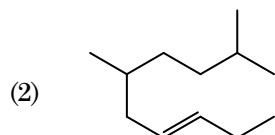
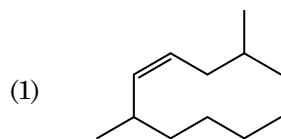


- (1) 2-methyl propan-2-ol
- (2) pentan-2-ol
- (3) pentan-3-ol
- (4) 2-methyl butan-2-ol

81. 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)  $2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2 \uparrow$

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



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. The RBC deficiency is deficiency disease of :

- (1) Vitamin B<sub>12</sub>
- (2) Vitamin B<sub>6</sub>
- (3) Vitamin B<sub>1</sub>
- (4) Vitamin B<sub>2</sub>

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

- (1) Beta ( $\beta^-$ )
- (2) Alpha ( $\alpha$ )
- (3) Gamma ( $\gamma$ )
- (4) Neutron (n)

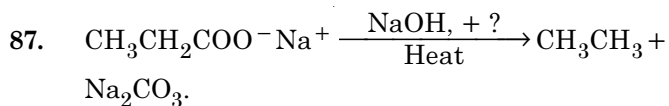
### Section - B (Chemistry)

86. 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) $\text{HOCl}(\text{g}) \xrightarrow{h\nu} \overset{\cdot}{\text{O}}\text{H} + \overset{\cdot}{\text{Cl}}$	(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.

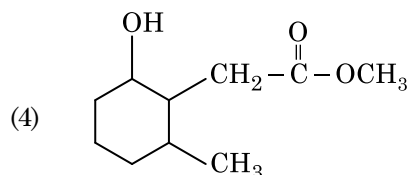
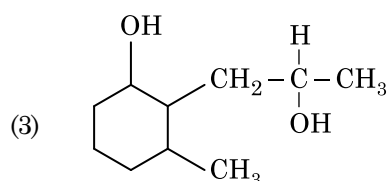
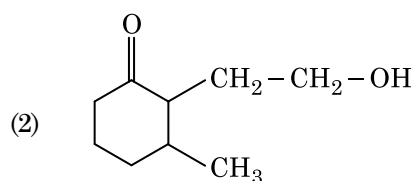
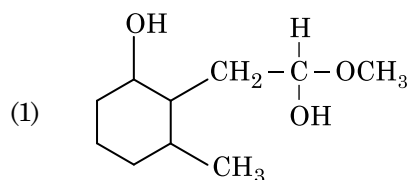
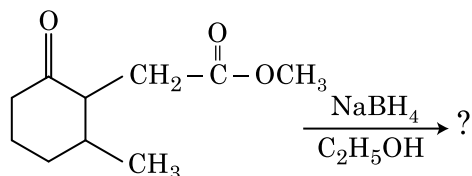
- (1) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
- (2) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
- (3) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)
- (4) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)



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

- (1) B<sub>2</sub>H<sub>6</sub>
- (2) Red Phosphorus
- (3) CaO
- (4) DIBAL-H

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



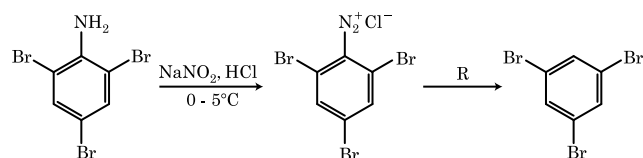
89. Match List - I with List - II.

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)
90. 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)  $\text{Fe}^{2+}$ ,  $\text{Mn}^{2+}$

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



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

92. Choose the correct option for the total pressure (in atm.) in a mixture of 4 g  $\text{O}_2$  and 2 g  $\text{H}_2$  confined in a total volume of one litre at  $0^\circ\text{C}$  is :

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

- (1) 2.518  
 (2) 2.602  
 (3) 25.18  
 (4) 26.02

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

- (1)  $\text{POCl}_3$   
 (2)  $\text{CH}_2\text{O}$   
 (3)  $\text{SbCl}_5$   
 (4)  $\text{NO}_2$

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

- (1)  $\text{HF} < \text{HCl} < \text{HBr} < \text{HI}$  : Increasing acidic strength  
 (2)  $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$  : Increasing  $\text{pK}_a$  values  
 (3)  $\text{NH}_3 < \text{PH}_3 < \text{AsH}_3 < \text{SbH}_3$  : Increasing acidic character  
 (4)  $\text{CO}_2 < \text{SiO}_2 < \text{SnO}_2 < \text{PbO}_2$  : Increasing oxidizing power

95. The correct option for the value of vapour pressure of a solution at  $45^\circ\text{C}$  with benzene to octane in molar ratio 3 : 2 is :

[At  $45^\circ\text{C}$  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


96. 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)  $2.50 \times 10^{-5} \text{ mol L}^{-1}$
97. 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  $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ ]

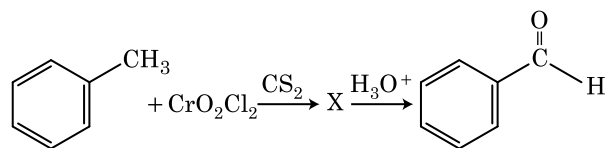
- (1)  $41.5 \text{ kJ mol}^{-1}$   
 (2)  $83.0 \text{ kJ mol}^{-1}$   
 (3)  $166 \text{ kJ mol}^{-1}$   
 (4)  $-83 \text{ kJ mol}^{-1}$
98. Match List - I with List - II.

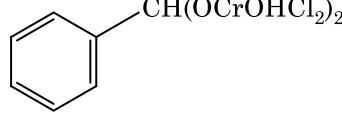
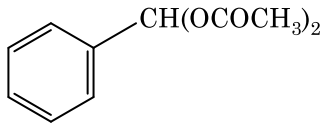
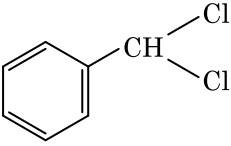
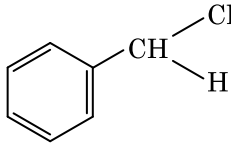
List - I	List - II
(a)  $\xrightarrow[\text{Anhyd. AlCl}_3/\text{CuCl}]{\text{CO, HCl}}$	(i) Hell-Volhard-Zelinsky reaction
(b) $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 + \text{NaOX} \longrightarrow$	(ii) Gattermann-Koch reaction
(c) $\text{R}-\text{CH}_2-\text{OH} + \text{R}'\text{COOH}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

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



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

100. 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)  $\Delta U \neq 0, \Delta S_{\text{total}} = 0$