

# CHEMISTRY QUESTION PAPER

Time Duration: 2Hrs

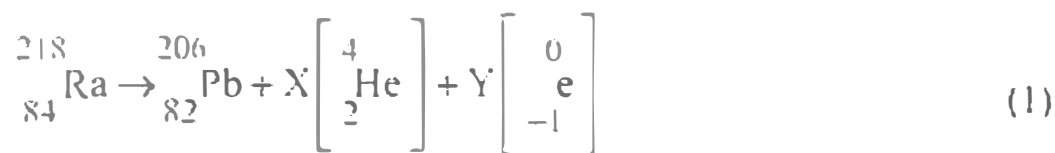
Maximum Marks:40

- Note :*
- (i) All questions carry equal marks.
  - (ii) Write balanced chemical equations and draw neat diagrams wherever necessary.
  - (iii) Use of logarithmic table is allowed.
  - (iv) Figures to the right hand side indicate full marks.
  - (v) Answer to every question must be written on a new page.

**Q. 1. Select and write the most appropriate answer from the given alternatives for each sub-question :** [8]

- (i) The chemical formula of Ziegler-Natta catalyst is (1)
  - (a)  $\text{CuCl}_2$
  - (b)  $\text{NiCl}_2$
  - (c)  $\text{CrCl}_3$
  - (d)  $\text{TiCl}_4$
- (ii) Isotonic solutions have the same (1)
  - (a) Density
  - (b) Osmotic pressure
  - (c) Molality
  - (d) Normality
- (iii) The molecularity and order of the reaction,  
 $2\text{NO}_{(g)} + \text{O}_{2(g)} \rightarrow 2\text{NO}_{2(g)}$  are respectively (1)
  - (a) one and one
  - (b) two and two
  - (c) three and three
  - (d) two and three

- (iv) Which of the following is an extensive property?  
 (a) Heat capacity      (b) Density  
 (c) Surface tension      (d) Specific heat
- (v) The values of 'X' and 'Y' in the following transformation reaction are respectively



- (a) 4, 3      (b) 3, 4  
 (c) 2, 4      (d) 4, 2
- (vi) Which of the following is NOT a Lewis acid?      (1)  
 (a)  $\text{AlCl}_3$       (b)  $\text{SnCl}_4$   
 (c)  $\text{CO}_2$       (d)  $\text{NH}_3$
- (vii) The time required to liberate one gram equivalent of an element by passing one ampere current through its solution is      (1)  
 (a) 6.7 Hrs      ( ) 13.4 Hrs  
 (c) 19.9 Hrs      (d) 26.8 Hrs
- (viii) Heat of formation of CO gas at 300 K is -110 kJ at constant pressure. Its heat of formation at the same temperature but at the constant volume is  
 (Given:  $R = 8.314 \text{ Jk}^{-1}\text{mol}^{-1}$ )      (1)  
 (a) -108.753 kJ      (b) -110 kJ  
 (c) 111.247 kJ      (d) -112.749 kJ

**Q. 2. (A) Attempt any ONE**      [8]

- (i) State and explain van't Hoff-Charles' law.      (2)  
 (ii) Define and explain translational energy.      (2)

**(B) Attempt any ONE :**

- (i) Derive an expression for Ostwald's dilution law for acetic acid. (2)
- (ii) Distinguish between electrolytic cell and galvanic cell. (2)

**(C) Answer the following :**

- (i) Define and explain the term 'molecularity of a reaction' with suitable example. (2)
- (ii) Write 'two' names and their chemical formulae of ores of zinc. (2)

**Q. 3. (A) Attempt any ONE :** [8]

- (i) Define hydrolysis. Show that the degree of hydrolysis of salt of weak acid weak base is independent of concentration. (3)
- (ii) What is natural radioactivity? Give 'four characteristics' of radioactivity. (3)

**(B) Attempt any ONE :**

- (i) What is rate constant? Write 'two applications' of rate law. (3)
- (ii) Transition elements show tendency to form large number of complexes. Explain. (3)

**(C) Answer the following :**

- Define: (i) Colligative property
- (ii) Standard electrode potential (2)

**Q. 4. (A) Answer the following :** [8]

Write 'two statements' of first law of thermodynamics.  
Derive Kirchhoff's equation. (4)

**(B) Answer any ONE :**

- (i) Describe the construction and working of Calomel electrode. (4)

- (ii) Describe cryoscopic method to determine the molecular mass of a non-volatile solute. (4)

**Q. 5. (A) Attempt any ONE [8]**

- (i) Calculate the heat of formation of diborane  $[B_2H_6(g)]$  at 298 K if the heat of combustion of it is  $-1941$  kJ/mol and heats of formations of  $B_2O_3(s)$  and  $H_2O(g)$  are  $-2368$  kJ/mol and  $-241.8$  kJ/mol respectively. (4)

- (ii) Calculate hydrolysis constant, degree of hydrolysis and pH of 0.02 M potassium acetate solution at 298 K.  
(Given : For acetic acid  $K_a = 1.8 \times 10^{-5}$  and  $K_w = 1 \times 10^{-14}$ .) (4)

**(B) Attempt any TWO :**

- (i) Calculate the osmotic pressure of 4.5 g of glucose (Molar mass = 180) dissolved in 100 ml of water at 298 K.  
(Given :  $R = 0.0821$  L atm mol<sup>-1</sup> k<sup>-1</sup>) (2)

- (ii) A solution of metal salt was electrolysed for 15 minutes, with a current of 1.5 A. The mass of a metal deposited was 0.00783 kg. Calculate the equivalent mass of metal. (2)

- (iii) Calculate the binding energy of  ${}_{83}^{209}\text{Bi}$  if its isotopic mass is 208.98 amu.  
(Given :  $M_H = 1.0078$  amu ,  $M_n = 1.0086$  amu.) (2)