CHEMISTRY QUESTION PAPER

Time : 2 Hrs. **Max. Marks : 40**

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

(i) Which of the following is NOT a state function ? (1)

(a) Work (b) Enthalpy

(c) Temperature (d) Pressure

(ii) The number of moles of hydroxide ions (OH^-) produced from two moles of sodium carbonate is (1)

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

(iii) Rust is (1)

(a) $Fe(OH)_3 \cdot FeO$ (b) $FeO \cdot xH_2O$

(c) $Fe_2O_3 \cdot xH_2O$ (d) $Fe(OH)_2$

(iv) The half life period of radioactive element depends on (1)

(a) temperature (b) pressure

(c) decay constant (d) its original quantity

(v) For the reaction A $\longrightarrow$ Product, if 'a' represents concentration o reactant, then the rate of reaction is given by (1)

(a) $-\frac{a}{t}$ (b) $-\frac{a}{dt}$ (c) $-\frac{da}{dt}$ (d) $-\frac{da}{t}$

(vi) Which of the following ores of zinc contains CO_3^{2-} (1)

(a) Calamine (b) Franklinite

(c) Willemite (d) Zinc blende

(vii) If 100ml of 1·0M NaOH solution is diluted to 1 dm^3, the molarity of resulting solution is (1)

(a) 1·0 M of NaOH (b) 0·1 M of NaOH

(c) 10·0 M of NaOH (d) 0·05 M of NaOH

(viii) When one mole of an ideal gas expands isothermally and reversibly from 1 dm^3 to 10 dm^3 at 300 K, work done is (1)

(a) $-2 \cdot 303 \times 300\ R$ (b) $-2 \cdot 303 \times n \times R$

(c) $-2 \cdot 303 \times \frac{300}{R}$ (d) $\frac{-2 \cdot 303}{n} \times R$

Q. 2 (A) Attempt any ONE of the following : **[8]**

(i) Write Nernst equation for single electrode potential and give meanings of the terms involved in it. (2)

(ii) Derive van't Hoff equation for dilute solutions. (2)

(B) Attempt any ONE of the following :

(i) Distinguish between isothermal and adiabatic process. (2)

(ii) Define Rate law.

What is the general outer electronic configuration of transition series elements ? (2)

(C) Answer the following :

(i) What is electrochemical series ? Explain its application in the determination of relative strengths of oxidising and reducing agents. (2)

(ii) Derive the integrated rate equation for a first order reaction (2)

Q. 3 (A) Answer any ONE of the following : **[8]**

(i) Explain Berkeley and Hartley's method to determine somotic pressure of solution with neat labelled diagram. (3)

(ii) What is Buffer solution ? Explain the mechanism of buffer action of acidic buffer. (3)

(B) Attempt any ONE of the following :

(i) Describe electrochemical theory of corrosion. Why is the prevention of corrosion needed ? (3)

(ii) Write the properties of α– particles and β– particles. (3)

(C) Answer the following :

(i) What is Pseudo first order reaction ? Explain with suitable example. (2)

Q. 4 Answer the following : [8]

Define : (i) Degree of hydrolysis, (ii) Lewis acid.

Show that $K_h = \frac{K_w}{K_a \cdot K_b}$ for the hydrolysis of salt of weak acid and weak base. (4)

(B) Answer any ONE of the following :

(i) Derive an expression for maximum work done during the expansion of an ideal gas in isothermal and reversible process.
The heat of neutralisation between acetic acid and sodium hydroxide is less than – 57 · 32 kJ. Explain. (4)

(ii) Write the names and chemical formulae of 'any two' ores of zinc.
What is the action of Sodium hydroxide (NaOH) on zinc ?
Define molecularity of chemical reaction. (4)

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

(i) 5 gram of sodium chloride is dissolved in 1000 gm of water. If the density of resulting solution is 0.997 gm / cm^3, calculate the
(a) Molarity (b) Molarity (c) Normality (d) Mole fraction of solute
(At. Wt. of Na = 23, Cl = 35.5, H = 1 and O = 16) (4)

(ii) From the following data, calculate the heat of formation of sucrose.
(a) $C_{12}H_{22}O_{11(s)} + 12\ O_{2(g)} \longrightarrow 12CO_{2(g)} + 11H_{2(l)}$: $\Delta H_1 = -5834{\cdot}18$ k J
(b) $C_{(s)} + O_{2(g)} \longrightarrow CO_2(g)$; $\Delta H_2 = -394{\cdot}96$ k J
(c) $H_{2(g)} + \frac{1}{2} O_{2(g)} \longrightarrow H_2O(l)$; $\Delta H_3 = -286{\cdot}18$ k J (4)

(B) Answer any TWO :

(i) Solubility product of magnesium hydroxide is $1{\cdot}4 \times 10^{-11}$. Calculate the solubility of magnesium hydroxide. (2)

(ii) Calculate the number of Coulombs required to deposit 2.7×10^{-2} kg of aluminium when the electrode reaction is $Al^{3+} + 3e^- \longrightarrow Al$.
(Given atomic weight of Al = 27) (2)

(iii) Binding energy per nucleon of $^{40}_{20}Ca$ nucleus is 8.216 M e V. Isotopic mass of the nucleus is 39.975 a. m. u. Find the calculated mass of $^{40}_{20}Ca$ in a. m. u. (2)