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GSM/D-21 **932**

PHYSICAL CHEMISTRY

Paper–IX : CH-202

Time Allowed : 3 Hours] [Maximum Marks : 32

Note : Attempt **five** questions in all, selecting **two** questions from each Unit. Question No. **1** is compulsory.

Compulsory Question

1. (i) Which of the following properties is/are intensive S, T, P, V ? 1

   (ii) What is Gibb's free energy? 1

   (iii) What do you understand by inversion temperature? 1

   (iv) In the expression for distribution law, how is the value of partition coefficient affected on changing the units of concentration. 1

   (v) Which salt is used as instant hot packs. 1

   (vi) What do you understand by chemical potential? 1

   (vii) What is law of mass action? 1

   (viii) Why is Zn added in Parker's process of desilverisation of Pb? 1

UNIT-I

2. (a) What do you mean by State Function and Path Function. Explain with examples. 2

   (b) Prove that Cp – Cv = R. Also explain why Cp is always greater than Cv. 2

   (c) What are the limitations of first law of Thermodynamics? 2

3. (a) Differentiate between Open, Closed and Isolated Systems with suitable examples. 3

   (b) Calculate the bond energy of S-F bond. The standard heat of formation values of $SF_6(g)$, S(g) and F(g) are –1100 KJ mol^{-1}, 275 KJ mol^{-1} and 80 KJ mol^{-1} respectively. 3

4. (a) What is Joule-Thomson coefficient? Derive an expression for the coefficient for an ideal gas. 3

(b) Calculate maximum work done in Joules when volume of 16.0g of O_2 at 300 K changes isothermally and reversibly from 5 litre to 50 litre. 3

5. (a) Show that for an adiabatic expansion of an ideal gas :

TV^{r-1} = constant. 3

(b) Define heat capacity. Derive expression for heat capacity at constant volume and that at constant pressure. 3

UNIT-II

6. (a) Write a note on Van't Hoff reaction isotherm. 3

(b) The value of equilibrium constant Kp for the reaction $N_2O_4 \rightleftharpoons 2NO_2$ at 25°C is 0.14. Calculate standard free energy change $\Delta G°$ for the reaction. 3

7. (a) Derive thermodynamic derivation fo Nernst distribution law. 3

(b) Water boils at 100°C at a pressure of 1 atm. Calculate the vapour pressure of water at 90°C. The heat of vaporization of water is 9.80 K Cal mol^{-1}. 3

8. (a) State and explain Le-Chatelier's principle. 3

(b) At 25°C, an aqueous solution of iodine containing 0.0576g per litre is in equilibrium with CCl_4 solution containing 4.412g of iodine per litre. If the solubility of iodine in water is 0.340 g/litre, what will be its solubility in CCl_4. 3

9. (a) What is the significance of extraction process in distribution law? 3

(b) Explain the use of distribution law in determining the degree of hydrolysis of aniline hydrochloride. 3