

CHEMISTRY Paper-VII

(Physical Chemistry-B)

Time : 3 Hours

Max. Marks : 22

Note : Attempt five questions in all with one question each from Section-A to D and Section-E is compulsory.

Section-A

1. (a) Derive that for reversible adiabatic expansion of an ideal gas :

$$TV^{\gamma-1} = \text{constant} \quad 2$$

- (b) Calculate the work done during isothermal expansion of one mole of an ideal gas from 10 atmospheres to 1 atmosphere at 27°C. 2

2. (a) Derive that Joule-Thomson coefficient is given by :

$$\mu = -\frac{1}{C_p} \left(\frac{\partial H}{\partial T} \right)_T \quad 2$$

- (b) Two moles of hydrogen at S. T. P. are compressed adiabatically to a volume of 10 litres. Calculate the final pressure and temperature of the gas given that γ for hydrogen is 1.41 2

Section - B

3. (a) Show that the temperature dependence of heat of reaction is given by the relation :

$$\left(\frac{\partial \Delta H}{\partial T} \right)_P = \Delta C_p$$

Name the equation. 2

- (b) Define enthalpy of neutralization and explain why ΔH_{neu} of strong acid with strong base is constant and the value changes if one of them is weak. 2

4. (a) The bond dissociation energy of gaseous H_2 , Cl_2 , and HCl are 430 kJ/mole, 242 kJ/mole and 427 kJ/mole, respectively. Calculate ΔH_f for HCl gas 2

- (b) What is Hess's law of constant heat summation? What is the thermodynamic basis of Hess's law? 2

Section - C

5. (a) Explain the origin of electric charge on colloidal particles. 2

- (b) Write notes on :

(i) Electrophoresis

(ii) Dialysis 2

6. (a) Discuss applications of colloids in :

(i) Smoke precipitation

(ii) Sewage disposal 2

- (b) Give differences between lyophilic and lyophobic colloids. 1
 (c) What are protective colloids? 1

Section– D

7. (a) Derive thermodynamically the relation $\Delta T_f = k_f \times m$ (m = molality of the solution). 2
 (b) A 4 per cent solution of sucrose $C_{12}H_{22}O_{11}$ is isotonic with 3 per cent solutions of an unknown organic substance. Calculate the molecular mass of the unknown substance. 2
8. (a) How is Van't Hoff factor used for the determination of degree of dissociation or degree of association of a solute in the solution? 2
 (b) What is the cause of elevation in boiling Pt. ? Explain clearly with the help of vapour- pressure temperature curve. 1
 (c) Explain why equimolar solutions of NaCl and canesugar do not have the same osmotic pressure. 1

Section– E

(Compulsory Question)

9. (a) Define the term 'Peptisation'.
 (b) What is 'collodion'?
 (c) What do you mean by 'Inversion temperature'?
 (d) Compare isothermal reversible expansion with adiabatic reversible expansion of an ideal gas.
 (e) What are the advantages of Berkeley and Hartely's method over other methods of measuring osmotic pressure ?
 (f) Define enthalpy of hydration. 6×1=6