B.A./B.Sc. (General) 2nd Semester

(2054)

CHEMISTRY

Paper : VII (Physical Chemistry-B)

(Same for B.Sc. Microbial & Food Tech.)

Time Allowed : Three Hours]   [Maximum Marks : 22

Note :— (1) Attempt **five** questions in all, **one** question from each Unit I, II, III and IV and Unit V is compulsory.

(2) Use of simple calculator is allowed.

UNIT—I

1. (a) What is Joule-Thomson coefficient ? Explain what you understand by Joule-Thomson coefficient and Inversion temperature. Derive the relationship between Joule-Thomson coefficient and heat capacity at constant pressure.

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

(b) State and explain Joule's law.   1

(c) Calculate the pressure-volume work performed by the system during isothermal reversible expansion of two moles of an ideal gas from 2 litres to 10 litres at 20°C.   1

2. (a) Derive that for reversible adiabatic expansion of an ideal gas $PV^\gamma = $ constant.

2

(b) Derive expression for w, q, ΔU and ΔH for isothermal reversible expansion of an ideal gas.

2

UNIT—II

3. (a) What do you understand by the heat of reaction at constant volume and that at constant pressure ? Derive the relationship between them. Under what conditions, the two are equal ?

2

(b) The Bond enthalpy of H_2 is 436 KJ mole^{-1} and that of N_2 is 941.3 KJ mole^{-1}. Calculate the average bond enthalpy of an N-H bond in ammonia. $\Delta H_f^\circ = -46$ KJ mol^{-1}.

2

4. (a) What is Hess Law of Constant Heat Summation ? What is the Thermodynamic basis of Hess law ?

2

(b) Define Enthalpy of Neutralization and explain why ΔH of strong acid with strong base is constant and values change if one of them is weak.

2

UNIT—III

5. (a) Explain the origin of Electric Charge on Colloidal Particles. Give some examples of positively and negatively charged Colloids.

2

(b) Discuss Application of Colloids in :

(1) Smoke Precipitation

(2) Sewage Disposal.

2

6. (a) What are Multimolecular, Macromolecular and Associated Colloids ? Give two examples of each. 2

(b) What are gels ? How they are prepared ? Describe the following properties of gels :

   (i) Syneresis

   (ii) Inhibition

   (iii) Thixotropy. 2

UNIT—IV

7. (a) Briefly explain at least 4 methods of expressing the concentration of a solution. Which out of these is preferred and why ? 2

(b) Derive Thermodynamically the relation $\pi = CRT$ where (π = Osmotic Pressure, C = Concentration, T = Temperature). 2

8. (a) A solution containing 0.5126 g of Napthalene in 50.0 g of Carbon tetra chloride yields a boiling point elevation of 0.402°C while a solution of 0.6216 g of an unknown solute in the same weight of the solvent gives a boiling point elevation of 0.647°C. Find the molecular weight of the unknown solute. 2

(b) Write a short on Vant Hoff factor (i). Derive the relationship between Degree of Dissociation (α) and Vant Hoff factor (i) in case of Uni-Bivalent Electrolyte. 2

UNIT—V

9. (a) What is Peptization ? Explain by taking a suitable example. 1

   (b) What are Ideal and Non ideal Solutions ? Explain by taking suitable examples. 1

   (c) Explain the following terms State and Path Functions. 1

   (d) How bond energies can be useful for calculating the enthalpy change of a reaction ? 1

   (e) Explain giving reasons that equimolar solution of sucrose and sodium chloride in water are not isotonic. 1

   (f) Explain the following terms Extensive and Intensive Properties. 1