Section–D

8. (a) Derive an expression for the amount of solute left unextracted after n instalments of v cc each from a solution containing W gm of the solute in Vcc of the solution. 4

(b) In the distribution of succinic acid between ether and water at 20°C, 25 cc of ethereal layer contained 0.08 gm of the acid. Find the weight of acid present in 50 cc of the aqueous solution in equilibrium with it, if the value of K for succinic acid between water and ether is 5.3. 4

9. (a) State and explain Nernst Distribution Law. Derive it thermodynamically. 4

(b) At 15°C an aqueous solution of oxalic acid containing 5.0 gm of oxalic acid per 100 cc of water is in equilibrium with an ethereal solution containing 0.5 gm per 100 cc. The solubility of oxalic acid in water at 15°C is 10 gm per 100 cc. Calculate the solubility in ether. 4

B.Sc. 3rd Semester (Hons) New Scheme

Examination, December–2015

CHEMISTRY

Paper–CH(H)–202, XIX

Physical Chemistry

Time allowed : 3 hours] *[Maximum marks : 40*

Note : ***Question No. 1 is compulsory****. You are to attempt one question from each section.*

1. (i) Define Joule-Thomson effect. 1×8

(ii) What is inversion temperature ?

(iii) Give the statement of Joule's law.

(iv) What is critical micellisation concentration (CHC) ?

(v) Why zinc is used in Parke's Process of desilverisation of lead ?

(vi) Which property remains constant when chemical equilibrium is attained ?

(vii) Give the important condition for a substance to be in the colloidal state.

(viii) Under what conditions K_p, K_c, K_a and K_x are all equal ?

Section–A

2. (a) Derive expressions for molar heat capacities C_v and C_p in terms of internal energy change and ethalpy change, and also show that $C_p - C_v = R$ for one mole of an ideal gas. 4

(b) Show that for an adiabatic expansion of an ideal gas PV^r = constant. 4

3. (a) State first law of thermodynamics in two different ways. Derive its mathematical formulation. 4

(b) One mole of an ideal gas expands from 5 bar to one bar at 298 K. Calculate the work done-

(i) for a reversible expansion

(ii) for an expansion against a constant external pressure of one bar. 4

Section–B

4. (a) Derive Van't Hoff equation

$$\frac{d(\ell n\, K_p)}{dT} = \frac{\Delta H^\circ}{RT^2}$$ 4

(b) With the help of Le-chatelier's principle, explain the effect of pressure on the freezing point of a liquid. 4

5. (a) The value of equilibrium constant K_p for the reaction $N_2O_4 \rightleftharpoons 2\,NO_2$ at 25°C is 0.14. Calculate standard free energy change ΔG° for this reaction. 4

(b) Derive Clausius-Clapeyron equation for vapour-liquid equilibrium. Also show how this equation can be expressed in the integrated form. 4

Section–C

6. (a) What is Brownian movement ? What is a cause of this phenomenon ? What is its importance ? 4

(b) What are gels ? How are they classified ? Compare their important characteristics. 4

7. (a) What is meant by coagulation or flocculation of colloidal sol ? Define Hardy-Schulze Rule. 4

(b) Explain the following properties of colloidal sols :

(i) Electrophoresis

(ii) Tyndall effect. 4