

This question paper contains 4+2 printed pages]

Your Roll No. ....

210

B.Sc. Prog./II

C

CH-203 PHYSICAL CHEMISTRY

(Admissions of 2008 and onwards)

Time : 2 Hours

Maximum Marks : 50

(Write your Roll No. on the top immediately on receipt of this question paper.)

Use of scientific calculator is allowed.

Attempt *four* questions in all.

Question No. 1 is compulsory.

1. Explain : 7×2
- (a) The effect of temperature on the viscosity of gas.
- (b) For strong electrolytes, conductivity increases sharply with increase in concentration while for weak electrolytes it starts at lower values in dilute solutions and increases much more gradually.

P.T.O

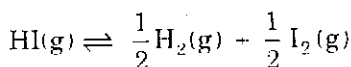
- (c) Arrhenius theory is not applicable to strong electrolytes.
- (d) Solutions of electrolytes do not obey Raoult's law.
- (e) Acetate ions have lower ionic conductivity than chloride ions.
- (f) Surface tension becomes zero at critical temperature.
- (g) In phase diagram of water fusion (melting point) curve is inclined towards the pressure axis.
2. (a) Derive the following relations using van der Waal equation :

$$(i) \quad P_c = \frac{a}{27b^2}$$

$$(ii) \quad P_c V_c = \frac{3}{8} RT_c \quad 4$$

- (b) For a gas A,  $P_c = 45.6 \text{ atm}$ ,  $V_c = 0.0987 \text{ dm}^3 \text{ mol}^{-1}$  and  $T_c = 190.6 \text{ K}$ . Calculate its van der Waals constants 'a' and 'b'. Also calculate the value of compressibility factor at critical point. 5

- (c) Define "Mean free path". What is the effect of temperature, pressure and volume on the mean free path ? 3
3. (a) In measuring surface tension of a liquid A by drop number method using stalagmometer for the same volume of A gave 55 drops while water gave 25 drops. Density of water is  $0.996 \text{ g cm}^3$  and density of the liquid is  $0.800 \text{ g cm}^3$  and surface tension of water is  $72 \text{ dyne cm}$ . Calculate the surface tension of liquid A. 4
- (b) In the dissociation of HI, 20% of HI is dissociated at equilibrium. Calculate  $K_p$  for



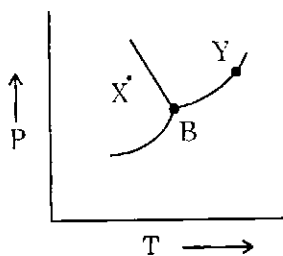
- (c) At 300 K, the vapour pressure of an ideal solution containing one mole of A and 3 moles of B is 550 mm of Hg. At the same temperature, if one mole of B is added

to this solution, the vapour pressure of solution increases by 10 mm of Hg. Calculate the V.P of A and B in their pure state. 4

4. (a) For the following system, determine the number of components : 4

$\text{NH}_4\text{Cl}(s)$ ,  $\text{NH}_3(g)$ ,  $\text{HCl}(g)$ , where the partial pressure of  $\text{NH}_3$  is equal to the partial pressure of  $\text{HCl}$  as is the case when the gaseous mixture is formed by the sublimation of  $\text{NH}_4\text{Cl}(s)$ .

- (b) Consider the phase diagram for a one component system as shown : 4



Calculate the number of degrees of freedom at points B, X and Y.

- (c) The partition coefficient of a solute X between chloroform and water is 0.2. Calculate the amount of solute extracted from 100 ml of aqueous solution containing 1 g of substance using 100 ml of chloroform in two equal instalments. 4
5. (a) State and explain Kohlrausch's law. Illustrate how this law is used for calculation of molar ionic conductances at infinite dilution of weak electrolytes. 5
- (b) Discuss briefly the potentiometric titration of weak acid against weak base. 4
- (c) Define : 3
- (i) Specific conductance
- (ii) Molar conductance and
- (iii) Equivalent conductance.

6. Write short notes on any *three* : 4×3
- (a) Calomel electrode
  - (b) Glass electrode
  - (c) Liquid junction potential
  - (d) Steam distillation
  - (e) Effect of impurities on C.S.T. of phenol-water system.
  - (f) Conductometric titration (only acid-base).