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Your Roll No . . . . .

**5170**

**B.Sc. (Prog.) / II J**

**CH-203 : PHYSICAL CHEMISTRY  
(NC – Admission 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 calculators is allowed.

Attempt **four** questions in all.

Question No 1 is compulsory

I. Explain :

- (a) Viscosity of gases increases with increase in temperature whereas that of liquids decreases with increase in temperature
- (b) Surface tension becomes zero at critical temperature.
- (c) In phase diagram of water fusion (melting point) curve is inclined towards the pressure axis.
- (d) Equivalent conductance increases with increase in temperature and decreases with increases in viscosity of medium

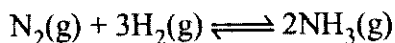
- (e) Solutions of electrolytes do not obey Raoult's Law
- (f) Advantages of potentiometric titrations.

$$2 \times 6 = 12$$

- II. (a) Define (i) collision diameter (ii) Mean free path.  
Derive a relation between collision diameter and mean free path of a gaseous molecule 4
- (b) Calculate the root mean square speed and most probable speed of hydrogen molecule at 27 °C 4
- (c) Give the physical significance of the van der Waals constants "a" & "b" What are their units ? Show that the van der Waals constant "b" is four times the actual volume occupied by molecules. 4½
- III. (a) Why do you use the same viscometer for liquids and water during the experimental determination of viscosity by Ostwald Viscometer method in the laboratory ? Describe the experiment 4
- (b) 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 g/cm<sup>3</sup> and density of the liquid is 0.8000 g/cm<sup>3</sup> and surface tension of water is 72 dynes/cm Calculate the surface tension of liquid A 3

(c) Derive the Vant Hoff Reaction isotherm  
 $\Delta G^\circ = - RT \ln K_p$  3

(d) For the chemical reaction



Partial pressure of  $\text{N}_2$  and  $\text{H}_2$  are 0.8 and 0.4 atm respectively at equilibrium Total pressure of the system is 2.8 atm Calculate  $K_p$  for the above reaction. 3

IV (a) Define (i) Phase (ii) Component (iii) Degree of Freedom

State the Gibbs Phase Rule 4

(b) Draw the phase diagram of the one component system of water Discuss and explain its salient features. 5½

(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 gm. of substance using 100 ml of chloroform in two equal installments 3

(a) State Raoult's Law of ideal solution. 2

(b) Define "Critical Solution Temperature" and give examples of a system having upper C.S.T and lower C.S.T Give the effect of impurity on C.S.T 4

- (c) Discuss in detail the method for the determination of the elevation in boiling point. 4
- (d) The freezing point of pure benzene is  $5.4^{\circ}\text{C}$  and that of a solution containing 2 gm of solute per 100 gm of benzene is  $4.4^{\circ}\text{C}$ . Calculate the molecular weight of solute ? [Given molal depression constant for benzene is  $5^{\circ}\text{C m}^{-1}$  ] 2½
- VI (a) State and explain Kohlrausch's Law of Independent Migration of Ions. 3
- (b) When a certain conductance cell was filled with 0.02 M KCl (with specific conductance  $0.002768\text{ ohm}^{-1}\text{ cm}^{-1}$ ) it had a resistance of 82.4 ohms at  $25^{\circ}\text{C}$ . When filled with 0.005 N  $\text{K}_2\text{SO}_4$  it had a resistance of 326 ohms. Calculate (i) cell constant (ii) conductance (iii) specific conductance (iv) equivalent conductance of 0.005 N  $\text{K}_2\text{SO}_4$  6
- (c) Write short notes on any one of the following
- (i) Calomel Electrode
- (ii) Glass Electrode
- (iii) Reversible Electrode 3½