বিদ্যাসাগর বিশ্ববিদ্যালয়

VIDYASAGAR UNIVERSITY

Question Paper

B.Sc. Honours Examinations 2022

(Under CBCS Pattern)

Semester - IV

Subject: CHEMISTRY

Paper : C 8-T

Physical Chemistry - III

Full Marks : 40

Time : 2 Hours

Candiates are required to give their answer in their own words as far as practicable.
The figures in the margin indicate full marks.

Group - A

Answer any ***four*** questions : 5×4=20

1. (a) A sample is either glucose or sucrose. How will you confirm the sample by osmotic pressure measurement ?

   (b) Write down he number of phases, components and degrees of freedom of the following equilibrium.

   $3Fe(s) + 4H_2O(g) = Fe_3O_4(s) + 4H_2(g)$ 3+2

2. (a) Construct a cell where following reaction occurs.

   $2AgCl(s) + H_2(g) = 2Ag(s) + 2HCl(aq)$

   (b) During heating at normal pressure ice melts but dry ice sublimates. Explain. 2+3

3. (a) Quinhydrone electrode should not be used above pH 8. Explain.

   (b) Using Debye Huckel limiting law determine the activity of 0.1 M $CaCl_2$ solution. Debye Huckel constant A = 0.51 2+3

4. (a) How will you confirm a sample as polar or non-polar by molar polarization measurement ?

   (b) Liquids A and B form an ideal solution. In a binary solution of A and B the mole fraction of A is 0.33. Calculate the composition of the vapour in equilibrium with the solution. 2+3

5. (a) What is radial distribution function ?

   (b) Boiling point of a solution is generally greater than that of pure solvent. Explain. 2+3

6. (a) Show that the commutator $\left[L^2, L_z\right] = 0$ where L is angular momentum operator.

   (b) Melting point of ice decreases with increasing pressure. Explain it using Clapeyron equation. 3+2

Group - B

Answer any ***two*** questions : 10×2=20

7. (a) Derive thermodynamically Raoult's Law of relative lowering of vapour pressure.

   (b) The emf of Weston cadmium standard cell is 1.01530V at 20°C and 1.01807V at 25°C. Calculate $\Delta G, \Delta S$ and ΔH for the cell reaction at 25°C.

   (c) State Gibbs phase rule. 4+4+2

8. (a) Draw and explain the phase diagram of CO_2. 5

   (b) What is critical solution temperature (C.S.T.) ? Explain it for water-phenol system. 3

   (c) Explain the Azeotropic Mixture with example. 2

9. (a) Calculate the mean ionic activity coefficient of a 0.001 molal solution Na_2SO_4. 3

   (b) What are the limitations of Debye-Huckel Limiting Law ? 2

   (c) Draw and explain conductometric titration plot for KCl and $AgNO_3$ reaction. 3

   (d) How does common ion effect affect pH ? 2

10. (a) Describe qualitatively the MO and VB treatment of Hydrogen molecule. 5

Or,

Describe qualitatively the procedure of setting up of Schrodinger equation for many electron atom (He). 5

(b) Deduce Duhem-Margulas equation and show that if Raoults law be applicable to one constituent of binary liquid mixture all componnts, it must be applicable to the other constituent. 3+2
