PG – 179

II Semester M.Sc. Examination, July 2017
(CBCS)
CHEMISTRY
C-203 : Physical Chemistry – II

Time : 3 Hours Max. Marks : 70

Instruction : *Answer Question No. 1 and* ***any five*** *of the* ***remaining*** *questions.*

1. Answer **any ten** of the following : **(10×2=20)**

   a) The thermodynamic properties such as H and S are extensive properties. Justify.

   b) Define 'fugacity' and mention its significance.

   c) Sketch the phase diagram of $CH_3COOH - CHCl_3 - H_2O$ system.

   d) Indicate the type of statistics applicable to the following particles. Justify your answer :

      i) Photons ii) Protons

      iii) H_2 iv) D_2.

   e) Explain phenomenological laws with an example.

   f) Comment on the statement, 'Entropy is not a conserved quantity'.

   g) Explain the origin of 'ionic atmosphere' for an ion in solution.

   h) What are triple ions ? How are they formed ?

   i) Sketch a typical electrocapillary curve and explain the curve.

   j) Differentiate between chemical catalysis and electro catalysis.

   k) Draw the polarogram of a solution containing two different metal ions. How is the polarogram useful for analysis of the solution ? Explain.

   l) Explain the following terms :

      i) Concentration over potential

      ii) Activation over potential.

2. a) Derive Gibbs-Duhem Margulus equation. Mention its significance.

   b) Derive the expression for partition function for translational motion of a molecule in 3 directions. **(5+5=10)**

P.T.O.

3. a) Explain the Apparent molar volume method of determination of partial molar volume.

   b) Discuss the application of phase rule to a three component system containing three pairs of partially miscible liquids. (4+6=10)

4. a) Discuss the Bose-Einstein statistics and obtain the expression for the distribution law.

   b) Write a note on Thermodynamic Excess functions and obtain the equations for G^E, S^E and H^E. (6+4=10)

5. a) Discuss the Debye-Huckel theory of mean ionic activity coefficients. Based on the theory, calculate the mean ionic activity coefficient of KCl at a molality of 0.02.

   b) Derive the Debye-Huckel limiting law and mention its limitations. (6+4=10)

6. a) Explain the quantitative thermodynamic treatment of electrified interfaces and obtain the Lippman equation.

   b) Obtain the expression for entropy and Gibbs free energy in terms of rotational partition function. (6+4=10)

7. a) Discuss the Gouy-Chapman theory of structure of electrified interface. Mention the limitations of the theory.

   b) Explain the quantum aspects of charge transfer at electrode solution interface. (5+5=10)

8. a) Give an account of thermodynamic aspects of surface excess.

   b) Describe the method of determination of interfacial tension across the interface. (5+5=10)