647510 **Msc1CheC0310** **Seat No :_____**

M.Sc.(Chem.) Semester - 1 (*CBCS*) Examination
Oct/Nov. -2019 - [OLD COURSE]
PHYSICAL CHEMISTRY (CORE)

Time: 2:30 Hours **Marks: 70**

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

Q.1 Answer any seven of the following ten questions. **[14]**

1. Explain electronic partition function for diatomic molecules.
2. Define term cell, micro and macro states.
3. Define term, fugacity and Activity.
4. Explain the influence of temperature on gas solubility.
5. Explain Debay –Huckel theory in more concentrated solution.
6. Explain the determination of standard potential of Zn/Zn^{+2}.
7. A solution of 2 mole NaOH in 4.2 moles of water has a vapour pressure of 4.474 mm. at 25^0C, whereas the vapour pressure of pure water is 12.78 mm. assuming that the activity coefficient of pure water is unity. Calculate the activity co-efficient of water in the solution.
8. Give the classification of electrochemical cells with suitable example.
9. Explain LJP.
10. Explain the solid –liquid equilibrium.

Q.2 Answer the following (Answer any three) **[14]**

1. Explain qualitative and quantative test of Debye- Huckel equation.

2. Describe ensemble and its classification.

3. Write note on Zn- silver accumulator.

4. Discuss the graphical method used to determine fugacity value.

Q.3 Answer the following questions. **[14]**

1. Derive equilibrium constant for the dissociation of weak acid;

   $logK = logK + 2A\sqrt{\alpha C}$ using the Debay –Huckel equation.

2. Derive the values of the following terms of thermodynamic functions.
   i. Internal energy and Free energy
   ii. Heat capacity and heat content.
   iii. Entropy
   iv. Work function

OR

Q.3 Answer the following questions. **[14]**

1. (a). Explain activity and activity co-efficient.

   (b). For oxygen the pressure and fugacities at 25°C are:

P atom	50	100	200	400
f atom	41.6	90.5	175.4	308.1

Calculate the change in thermodynamic potential in compressing 1 mole of O_2 at 25°C from 100 to 400 atmospheres under ideal and non-ideal conditions.

2. Describe the depression freezing point of the dilute solutions.

Q.4 Answer the following questions. (Any three) **[14]**

1. Derive an expression for Boltzmann distribution law.
2. Write short note on Dry cell.
3. Discuss the variation of fugacity with temperature.
4. Explain liquid and vapour composition of ideal solution.

Q.5 Answer any two of the following four questions. **[14]**

1. Explain concentration cell. Derive the concentration cell without transference.
2. (a). Explain thermodynamic probability.

   (b). Calculate the translation partition function for one mole of nitrogen at 2 atmospheres and at 27°C, Assuming the gas to behave ideally. Given that:

   $N = 6.023 \times 10^{23}$; $k = 1.38 \times 10^{-16}$ erg deg^{-1} mol^{-1};

   $h = 6.624 \times 10^{-27}$ erg sec.; $R = 82.06$ cc. atm deg^{-1} $mole^{-1}$.
3. Evaluation the Debye-Huckel constant A and B for methanol and water at 25°C.The dielectric constants being 31.5 and 78.54 respectively.
4. The melting point of p- Chlorobenzene is 53.5°C and that of naphthalene is 80.2°C the authentic temperature is30.2°C when the mole fraction of naphthalene in liquid phase is 0.395. Calculate the molar heat of fusion of the two components of the system, consuming ideal behaviour.

****