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

M.Sc.(Chem.) Semester - 1 (*CBCS*) Examination
Nov/Dec-2023 (SYLLABUS YEAR JUNE-2016)
PHYSICAL CHEMISTRY (CORE)

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

Instructions:

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

Que.1 Answer any seven of the following ten questions. (14)

1) Discuss the thermodynamic probability.
2) Explain about the types of statistic thermodynamic.
3) Explain Debay –Huckel limiting law.
4) Define term the Activity and fugacity.
5) Give characteristics of the non-ideal Solution.
6) Give the classification of electrochemical cells.
7) Explain elimination of liquid junction potential.
8) Explain effect of temperature on solid –liquid equilibrium.
9) Explain Debay –Huckel theory in concentrated solution.
10) A solution of 1 mole NaOH in 4.7 moles of H_2O has a vapour pressure of 4.47 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 H_2O in the solution.

Que.2 Answer the following. (Answer any three) (14)

1) Discuss about solubility of sparingly soluble salt in the presence of inert electrolyte.
2) Describe various potential energy functions of mono atomic gases.
3) Write note on Lead accumulator.
4) Discuss the equation method used to determine fugacity value.

Que.3 Answer the following questions. (14)

1) Derive equilibrium constant for the dissociation of weak acid;
   $\log K = \log K + 2A\sqrt{\alpha C}$ using the Debay –Huckel equation.
2) Compare third law and statistical entropies with suitable example.

OR

Que.3 Answer the following questions.

1) (A) Explain the term fugacity. How will you determine the fugacity of a real gas?
   (B) For oxygen the pressure and fugacities at 0°C are:

P atom	50	100	200	400
f atom	48	92.5	175	338

   Calculate the change in thermodynamic potential in compressing 2 mole of H_2 at 0°C from 100 to 400 atmospheres under ideal and non ideal conditions.
2) Describe the depression boiling point of the dilute solutions.

Que.4 Answer the following questions. (Any three) (14)

1) Derive Fermi - Dirac distribution law.

$$n_i = {g_i}/{e^{\alpha+\beta\epsilon i} + 1}$$

2) Explain Zn-Ag accumulator.
3) Describe variation of fugacity with temperature and pressure.
4) Explain liquid and vapour composition of non ideal solution.

Que.5 Answer any two of the following four questions. (14)

1) Derive the chemical cell with transference and without transference.
2) (A) Explain partition function and thermodynamic function.

   (B) Calculate the translation partition function for 1 mole of oxygen at 1 atm pressure at 27°C, Assuming the gas to behave ideally. The following data are given; Atomic weigh of oxygen=16, N= 6.023×10^{23}, k= 1.38×10^{-16}erg/degree/mol, h= 6.624×10^{-27}erg sec, R= 82.06 cc.atm/dgree/mole.
3) The vapour pressure of liquid ethylene is 41.6 atm at 0°C and 25.8 atm at -20°C. Estimate the ideal solubility of the gas in a liquid at 25°C and one atm pressure. How many grams of ethylene should dissolve in 1000 gm of benzene under these conditions if gas and solution behave ideally.
4) The solubility of Silver Iodide in pure water at 27°C is 1.771×10^{-4} mole lit^{-1}. Calculate the solubility in the presence of 0.1301×10^{-2}, 0.3252×10^{-2}, 0.6503×10^{-2}, 1.410×10^{-2} and 18.98×10^{-2} mole lit^{-1} of potassium nitrate.

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