647510 **MSCphyCC1030** **Seat No :_____**

M.Sc.(Chem.) Semester - 1 (*CBCS*) Examination
Oct/Nov. -2018
PHYSICAL CHEMISTRY (CORE)

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

Instructions:

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

Unit-I (14 Marks)
Answer ALL questions.

Que-1 (a) Answer the following. (04)

(1) Discuss the thermodynamic entropy and probability.

(2) Explain the concept of the ensemble.

(b) Answer any two questions out of three. (10)

(1) Describe Rotational and Vibrational partition functions of diatomic gases.

(2) Describe translation partition functions of mono atomic gases.

(3) Derive appropriate relation for Bose-Einstein distribution laws.

$$n_i = \frac{g_i}{e^{-a-\beta\varepsilon i}-1}$$

Unit-2 (14 Marks)
Answer ALL questions.

Que-2 (a) Answer the following. (04)

(1) Explain the term Activity and activity coefficient.

(2) A solution of 1.3 mole NaOH in 4.6 moles of water has a vapour pressure of 4.478 mm. at 15°C, whereas the vapour pressure of pure water is 12.788 mm. Assuming that the activity coefficient of pure water is unity. Calculate the activity co-efficient of water is unity. Calculate the activity co-efficient of water in the solution.

(b) Answer any two questions out of three. (10)

(1) Define term fugacity. Describe any one method for the determination of fugacity value.

(2) Write a short note on variation of fugacity with pressure and temperature.

(3) Describe Mixture of ideal gases and real gases.

Unit-3 (14 Marks)
Answer ALL questions.

Que-3 (a) Answer the following. (04)

(1) Explain: Henry law.

(2) Explain vapour pressure curves of ideal solution.

(b) Answer any two questions out of three. (10)

(1) The melting point of p- Chlorobenzen is 53.2°C and that of naphthalene is 80.2°C the authentic temp. Is 30.2°C when the mole fraction of naphthalene in liquid phase is 0.392. Calculate the molar heat of fusion of the two components of the system, consuming ideal behavior.

(2) Explain: ideal and non-ideal solutions. Use the Gibbs-Duhem equation to derive the Duhem-Margules equation.

(3) Explain and draw phase diagram of partially miscible three liquid systems.

Unit-4 (14 Marks)
Answer ALL questions.

Que-4 (a) Answer the following. (04)

Describe Vant-Haff reaction isotherm.

(b) Answer any two questions out of three. (10)

(1) Define chemical equilibrium and Describe homogeneous reactions in dilute solutions.
(2) Derive an expression for the chemical equilibrium constant and standard free energy of the reaction.
(3) (a) Explain simultaneous equilibria.
(b) The standard free energy for the reaction $CO_2 \rightarrow CO + ½ O_2$ is a 61.44 k Cal and that for reaction $H_2O \rightarrow H_2 + ½ O_2$ is a 54.65 k Cal at 25°C. Calculate K_f for the "Water gas" reaction at this temperature.

Unit-5 (14 Marks)

Answer ALL questions.

Que-5 (a) Answer the following. (04)

(1) Give characteristics of the catalyst.
(2) Define Promoters with suitable examples.

(b) Answer any two questions out of three. (10)

(1) Give a brief explanation about the types of Homogeneous and Heterogeneous catalyst.
(2) Write a short note on.
i. Autocatalysis
ii. Enzyme catalysis
(3) Describe the Mechanism of acid-base catalyst.

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