

M.Sc. Semester - 1 (CBCS) Examination
Jan/Feb. -2022 [OLD COURSE]
PHYSICAL CHEMISTRY (CORE)

Time: 1:30 Hours**Marks: 42****Instructions:**

1. Figures to the right indicate marks.
 2. There are five questions in the question paper.
 3. Answer any three of the following questions.
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Q.1 Answer any seven of the following ten questions.**[14 Marks]**

1. Define the term probability.
2. Briefly Explain the following terms: assembly and ensemble
3. Explain; Mean ionic activity co-efficient of electrolyte.
4. Define term fugacity. How it is related to Activity?
5. Differentiate between ideal and non ideal solutions.
6. The Vapour pressure of a pure liquid is 100 torr at 25°C. While its vapour pressure from a 97 mole percentage solution at the same temperature is only 92.5 torr. What are the activity and activity co-efficient of the liquid in the solution?
7. Give the classification of electrochemical cells.
8. What is liquid junction potential and how it is eliminated?
9. Explain the influence of temperature on gas solubility.
10. Explain Debye –Huckel theory in more concentrated solution.

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

1. How partition function is applied to monoatomic gases?
2. Discuss the generalized method used to determine fugacity value.
3. Discuss about Debye –Huckel equation and equilibrium constant.
4. Write a note on Zn-Ag accumulator.

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

1. (a) Explain Application of Debye –Huckel theory.
(b) Write a note on liquid and vapor composition for non ideal solution.
2. Compare third law and statistical entropies with suitable example.

OR

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

- (a) Write a note on the mixture of ideal gases and real gases.
- (b) For oxygen the pressure and fugacities at 0°C are:

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

Calculate the change in thermodynamic potential in compressing 2 mole of O₂ from 50 to 200 atmospheres under ideal and non ideal conditions.

- Describe the depression boiling point of the dilute solutions.

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

- Derive Boltzmann-Maxwell distribution law.
- Explain Dry cell.
- Write note on Duhem-Margules equation.

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

- Derive the equation for concentration cell without transference.
- (a). Explain partition function and thermodynamic function.
(b). Calculate the translation partition function for 1 mole of oxygen at 1 atm pressure at 25°C, Assuming the gas to behave ideally. The following data are given;
Atomic weight of oxygen=16, $N = 6.023 \times 10^{23}$, $k = 1.38 \times 10^{-16}$ erg/degree/mol,
 $h = 6.624 \times 10^{-27}$ erg sec, $R = 82.06$ cc.atm/degree/mole.
- Evaluate the Debye-Huckel constant X and Y for methanol and water at 25°C. The Dielectric constant being 31.5 and 78.54 respectively.
- The vapour pressure of liquid ethylene is 40.6 atm at 0°C and 24.8 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.
