

PARUL UNIVERSITY
FACULTY OF APPLIED SCIENCE
M.Sc. Summer 2018-19 Examination

Semester: 2
Subject Code: 11205153
Subject Name: Physical Chemistry-II

Date: 05/04/2019
Time: 10:30am to 1:00pm
Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1. A) Answer the following: (08)

- (a) What is the Thermodynamic significance of partial molar properties?
- (b) Calculate the fugacity of one mole of methane gas at 50°C and 400 atm pressure. Given the integral value $\int_0^P (V - \frac{RT}{P}) dP$, evaluated graphically is -17.27 under the conditions of temperature and pressure. [R = 1.9872 cal. deg⁻¹.mole⁻¹, R = 0.082054 lit.atm.deg⁻¹.mole⁻¹]

Q.1. B) Answer the following questions (ANY TWO):

- (a) 1. Explain the graphical behavior of the variation of fugacity of a gas as a function of pressure. (04)
 2. List out the methods used for determining the values of Partial molar quantities.
- (b) Write a short note on: Graphical method (04)
- (c) How one can use the Equation of State method for evaluating the value of the fugacity of a gas? (04)
 Why this method is called as Equation of State method? What is its limitations? How does it overcome?

Q.2. A) Answer the following questions.

- (a) 1. Write the statistical definition of Entropy for an isolated assembly. What does it provide? (04)
 2. Define the term: Partition function.
- (b) Give the values for the Translational Partition Function and Rotational Partition Function. Signify the terms involved in them. (04)

Q.2. B) Answer the following questions (ANY TWO):

- (a) 1. Define the term with example: Assembly of localized systems (03)
 2. Give the examples of systems.
 3. Write the value of the Electronic Partition Function.
- (b) Define the terms: (03)
 (i) Micro-Canonical Ensemble
 (ii) Macro-Canonical Ensemble
 (iii) Grand-Canonical Ensemble
- (c) Explain the term: Statistical Thermodynamics (03)

Q.3. A) Answer the following: (08)

- (a) What is meant by an Ideal solution? State its properties.
- (b) Give two examples of each of the following: (i) solutions exhibiting positive deviation from Ideal behavior and (ii) solutions exhibiting negative deviation from Ideal behavior

Q.3. B) Answer the following questions (ANY TWO):

- (a) 1. Define the term: Dilute solution (04)
 2. List out the methods used for determining the values of the activities of the solutions.
- (b) Determine the mean ionic molality of a 0.5 molal solution of sodium sulfate. (04)
- (c) Write a brief note on: Ionic Strength Principle. (04)

Q.4. A) Answer the following :

- (a) 1. Define the term: Thermodynamic Equilibrium (04)
2. State the influence of pressure on the values of K_f and K_c .
- (b) Write the general form of the Reaction Isotherm. State its significance from the chemical view point. Give the criteria for a reaction to occur. (04)

Q.4. B) Answer the following questions (ANY TWO):

- (a) Write correct option in your answer sheet for the following three multiple choice questions: (03)
- Van't Hoff derived the expression for Reaction Isochore considering
(A) a constant volume system
(B) a constant pressure system
(C) a constant temperature system
(D) None of the above
 - For a process, at constant P and T, to be spontaneous
(A) $\Delta F = +ve$
(B) $J_a < K$
(C) $\Delta F = \text{zero}$
(D) $J_a > K$
 - As per the Van't Hoff equation, for an exothermic reaction, the value of the
(A) equilibrium constant decreases as the temperature is raised
(B) equilibrium constant increases with temperature
(C) equilibrium constant decreases with temperature
(D) None of the above

- (b) Write the form of the law of equilibrium for the general reaction: (03)



What does it provide?

- (c) Write the integrated form of the Van't Hoff equation, over a short range of temperature, considering limits of integration. State its applications. (03)