

M.Sc.(Chem.) Semester - 1 (CBCS) Examination
Nov/Dec-2023 (SYLLABUS YEAR JUNE-2018)
PHYSICAL CHEMISTRY(CORE)

Time: 2:30 Hours

Marks: 70

Instructions:

- Figures to the right indicate marks.
- All questions are compulsory.

- Que.1(A) Answer the following. (04)
 1) Describe Translation partition functions of diatomic gases.
- Que.1(B) Answer any two questions out of three. (10)
 1) Calculation of equilibrium constants in term of partition function.
 2) Derive the values of the following terms of molar partition function.
 (i) Internal energy (iii) Free energy
 (ii) Entropy (iv) Heat capacity
 3) Derive Fermi - Dirac distribution law.

$$n_i = \frac{g_i}{e^{\alpha + \beta \epsilon_i} + 1}$$
- Que.2(A) Answer the following. (04)
 1) Define the term fugacity and activity.
 2) The vapour pressure of a pure liquid is 105 torr at 25° C while its vapour pressure from a 95 mole per cent solution at the same temperature is only 87 torr. What is the activity and activity coefficient of the liquid?
- Que.2(B) Answer any two questions out of three. (10)
 1) Describe the generalized method for the determination of fugacity value.
 2) Describe Mixture of ideal gases and real gases.
 3) Write a short note on variation of fugacity with pressure and temperature.
- Que.3(A) Answer the following. (04)
 1) Discuss the properties of an ideal solution.
 2) Explain: Henry law.
- Que.3(B) Answer any two questions out of three. (10)
 1) The freezing point of a solution of 0.321gm of substance S in 52.12 gm of benzene was found to be 5.155°C. The freezing point of pure benzene is 5.4°C. If molal depression of freezing point per 1000 gm of solvent be 0.512°C. Calculate the molecular weight of S.
 2) Write a short note on.
 (i) Vapour pressure curves of non ideal solution.
 (ii) Effect of temperature on solid -liquid equilibrium.
 3) Explain systems exhibiting formation of three pair of partially miscible liquids.
- Que.4(A) Answer the following. (04)
 1) Derive an expression for chemical equilibrium constant.
- Que.4(B) Answer any two questions out of three. (10)
 1) Describe Vant- Haff reaction isotherm.
 2) Derive standard free energy of reaction and the reaction isotherm.
 3) The standard free energy for the reaction $\text{CO}_2 \rightarrow \text{CO} + \frac{1}{2} \text{O}_2$ is 61.43 k cal and that for reaction $\text{H}_2\text{O} \rightarrow \text{H}_2 + \frac{1}{2} \text{O}_2$ is 54.35 k cal at 27°C. Calculate K_f for the water gas reaction.
- Que.5(A) Answer the following. (04)
 1) Define: promoters
 2) Give characteristics of the catalyst.
- Que.5(B) Answer any two questions out of three. (10)
 1) Describe the Mechanism and kinetics of acid-base catalysis.
 2) Write a short note on heterogeneous catalyst.
 3) Explain the Enzyme catalysis in brief with suitable examples.
