

M.Sc.(Chem.) Semester - 1 (CBCS) Examination
Jan/Feb.-2022 [NEW 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.

Q.1 (a) Answer the following**4 Marks**

- (1) Discuss the concept of the Ensemble
- (2) Explain the Monoatomic solids.

2

2

Q.1 (b) Answer any two questions out of three.**10 Marks**

- (1) Describe Electronic and Rotational partition functions of diatomic molecules.
- (2) Calculate the value of equilibrium constants in term of partition function.
- (3) Derive appropriate relation for Maxwell-Boltzmann distribution law.

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$$n_i = g_i e^{-\alpha - \beta \epsilon_i}$$

Q.2 (a) Answer the following**4 Marks**

- (1) Explain fugacity function
- (2) Calculate the free energy change accompanying the compressing 1 mole of a gas from 25 to 300 atmospheres. The fugacity of the gas may be taken as 23 and 90.5 atmospheres respectively at 50°C temp.

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Q.2 (b) Answer any two questions out of three.**10 Marks**

- (1) Describe the equation state method for the determination of fugacity.
- (2) Write a note on variation of fugacity with pressure and temperature
- (3) Write a short note on Activity and Activity coefficient.

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Q.3 (a) Answer the following**4 Marks**

- (1) Prove the composition of liquid and vapour in equilibrium.

2

$$P = \frac{P_B^0 P_A^0}{P_A^0 + X_A' (P_B^0 - P_A^0)}$$

- (2) Calculate the boiling point of solution containing 5.3 gm urea in 100 gm of water at $K_b = 0.513$.

2

Q.3 (b) Answer any two questions out of three.**10 Marks**

- (1) Describe the depression freezing point of the dilute solutions.
- (2) Write a short note on
 - a) Duhem-Margules equation.
 - b) Liquid and vapor compositions for non-ideal systems
- (3) Explain systems exhibiting formation of one and three pair of partially miscible liquids.

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Q.4 (a) Answer the following**4 Marks**

Derive an expression for chemical equilibrium constant.

4

- Q.4 (b) Answer any two questions out of three. 10 Marks**
- (1) Describe homogeneous reactions in liquid and dilute solutions. 5
 - (2) Write a short note on 5
 - c) Vant- Haff reaction isotherm
 - d) Simultaneous equilibria
 - (3) It is require to pass CO at 10 atm. And water vapor at 5 atm. Pressure into a reaction chamber at 500°C and to withdraw CO₂ and H₂ at partial pressure of 2.5 atm. It is possible theoretically ? The equilibrium constant for the reaction is known to be 0.73. 5
- Q.5 (a) Answer the following 4 Marks**
- (1) Explain Activators with suitable examples. 2
 - (2) Explain about catalytic coefficient. 2
- Q.5 (b) Answer any two questions out of three. 10 Marks**
- (1) Explain types of acid base catalyst with suitable example. 5
 - (2) Write a note on Enzyme catalysis. 5
 - (3) Kinetics of Heterogeneous catalyst. 5
