

**G-2/215/21**

Roll No. ....

**M.Sc. II Semester Examination, 2021**

**CHEMISTRY**

Paper III

(Physical Chemistry)

Time : 3 Hours ]

[ Max. Marks : 80

**Note :** All questions are compulsory. Question Paper comprises of 3 sections. Section A is objective type/multiple choice questions with no internal choice. Section B is short answer type with internal choice. Section C is long answer type with internal choice.

**SECTION A**

**1×8=8**

**(Objective Type Questions)**

Choose the correct answer :

1. Chemical potential (an intensive property) of a substance is a force that drives the chemical system to equilibrium and is equal to its partial molar properties. The ratio of chemical potential to free energy of pure substance at constant temperature and pressure is :  
(a) 0 (b) 1  
(c)  $\propto$  (d) None of these
2. Phase diagram (also known as equilibrium

P.T.O.

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Diagrams) shows the multi system state changes with the :

- (a) Temperature (b) Pressure  
(c) Composition (d) All of the above
3. Canonical ensemble is related to :  
(a) Size of system  
(b) The number of particles in system  
(c) Thermal equilibrium of system  
(d) Freedom of the system.
4. The mass transfer process  $J_m = -D \frac{dc}{dx}$  is known as :  
(a) Fick's law (b) Fourier's law  
(c) Newton's law (d) Onsager's law
5. The ionic strength of 0.25 molal  $K_2SO_4$  solution will be equal to :  
(a) 0.25 (b) 0.50  
(c) 0.75 (d) 1.0
6. The effect that tends to retard the mobilities of ions in solutin is :  
(a) Asymmetry effect (b) Relaxation effect  
(c) Electrophoretic effect  
(d) All of the above

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7. In the micellization process, the change in the Gibb's free energy becomes :

- (a) Zero (b) More than zero  
(c) Less than zero (d) None of the above.

8. BET isotherm is an example of :

- (a) Monolayer Adsorption  
(b) Biomolecular Layer Adsorption  
(c) Multilayer Adsorption  
(d) All of the above.

### SECTION B

4×6=24

#### (Short Answer Type Questions)

**Note :** Attempt all questions. All questions carry equal marks.

#### Unit-I

1. Discuss briefly the system consisting of acetic acid chloroform-water at one atmospheric pressure with the help of the phase-rule.

Or

Explain the terms fugacity and activity in detail.

#### Unit-II

2. Calculate the number of ways to distribute :

- (i) Two distinguishable objects in two boxes.  
(ii) Two indistinguishable objects in two boxes.

Or

Write a short note on 'Forces and Fluxes'.

#### Unit-III

3. What is corrosion ? Explain the various factors which influence corrosion.

Or

Distinguish between Wien effect and Debye-Falkenhagen effect in brief.

#### Unit-IV

4. What do you understand by electrocatalysis and immobilization ? Explain with suitable example in brief.

Or

Define 'surface tension'. Discuss 'Laplace equation' for capillary action.

## SECTION C

12×4=48

## (Long Answer Type Questions)

**Note :** Attempt all questions. All questions carry equal marks.

**Unit-I**

1. What are the partial molar properties ? How are they determined ?

Or

How the values of activity and activity coefficient determined by any of the two method given below :

- (a) Freezing point method,
- (b) Vapour Pressure method,
- (c) Solubility method,
- (d) E.M.F. method.

**Unit-II**

2. What is quantum statistics ? Discuss Fermi-Dirac statistics in detail.

Or

What do you mean by Onsager relation ? Give a proof of Onsager's reciprocal relation and validity of Onsager's equation and its verification.

**Unit-III**

3. Discuss the meaning of overpotential in electrochemistry. Explain the various factors affecting overpotential.

Or

Derive Ilkovic equation. Discuss the extension of Ilkovic equation.

**Unit-IV**

4. Discuss the thermodynamics of micellization. Explain solubilization with suitable example in brief.

Or

Derive Gibb's adsorption isotherm, relating surface tension and adsorption. Discuss positive and negative which influence corrosion.

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