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**NY—210—2023**

**FACULTY OF SCIENCE**

**M.Sc. (First Year) (Second Semester) EXAMINATION**

**NOVEMBER/DECEMBER, 2023**

**(New/CBCS Pattern)**

**CHEMISTRY**

**Paper-II (CH-423)**

**(Physical Chemistry)**

**(Monday, 11-12-2023)**

**Time : 10.00 a.m. to 1.00 p.m.**

*Time—3 Hours*

*Maximum Marks—75*

*N.B.* :— (1) Attempt all questions.

(2) Use of calculator and log-table is allowed.

1. Solve any *three* :

15

- (a) (i) What is enzyme catalysis ? Explain with examples.  
(ii) State Michaelis-Menten equation and explain its significance.

(b) Write an account on 'Flash Photolysis' to study fast reactions.

(c) From the following data for a polydisperse polymer :

Mixture :	Mass (%)	25.0	50.0	75.0
	M <sub>i</sub> (kg/mole)	1.0	1.20	1.40

Calculate  $M_{\bar{u}}$  and  $M_{\bar{w}}$

- (d) Explain the kinetics of the decomposition of Ethane.  
(e) What is Stauding's equation ? Explain.

The intrinsic viscosity of myosin is  $217 \text{ cm}^3 \text{ gm}^{-1}$ . Calculate the approximate concentration of myosin in water which would have a relative viscosity of 1.5.

P.T.O.

2. Solve any *three* :

15

- (a) Describe how exchange current density,  $S_0$  is determined from 'Tafel plot'.
- (b) What is half-wave potential ? Explain the advantages of using DME in polarography.
- (c) Write in brief on :
  - (i) Fire resistant, and
  - (ii) Liquid-crystal polymers.
- (d) State the principle involved in polarography and explain its experimental set-up with any *one* application.
- (e) Explain effect of light at semiconductor solution interface.

3. Attempt the following :

- (a) Describe BET theory for multilayer adsorption.

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*Or*

What are salt effects ? Explain the influence of ionic strength on the rates of ionic reactions.

- (b) Explain Osmometry method used to determine molar masses of macromolecules.

7

*Or*

Derive Butler-Volmer equation in the kinetics of electrode reactions. Explain variation of current density with overpotential in accordance with Butler-Volmer equation in short.

4. Attempt the following :

- (a) What is meant by Half-life period of any chemical reaction ? Show that for a first-order reaction, time required for 99.9% completion of the reaction is ten-times that required for 50.0% completion.

8

Or

What is over-potential ? Explain Oxygen over-voltage and Hydrogen over-voltage in detail.

- (b) What is role of CMC in Micelle formation ? Explain the effect of temperature and added electrolyte on CMC of ionics. 7

Or

Explain the dynamics of unimolecular reactions using K-R-R treatment.

5. Write short notes on (any *three*) : 15

- (i) Thermodynamic formulation of transition-state theory.
- (ii) Theory of double layer at semiconductor electrolyte solution interface.
- (iii) Laplace equation.
- (iv) Surface active agents.