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NEPRT—143—2024

FACULTY OF SCIENCE

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

APRIL/MAY, 2024

CHEMISTRY

Paper-II-SCHEC-453

(Physical Chemistry)

(Tuesday, 23-04-2024) **Time : 10.00 a.m. to 1.00 p.m.**

Time—3 *Hours* *Maximum Marks*—80

N.B. :— (1) Q. No. **1** is compulsory.

(2) Solve any *three* questions from Q. Nos. **2** to **6**.

(3) Use of log table and calculator is allowed.

(4) Figures to the right indicate full marks.

1. Solve the following : 20

(*a*) What are surface active agents ? Discuss their classification in detail with examples.

(*b*) Define $\overline{M}_M$ and $\overline{M}_N$. Determine $\overline{M}_N$ and $\overline{M}_M$ of a polymer sample containing of equal number of molecules with M_1 = 20,000 and M_2 = 2,00,000. Also calculate polydispersity index.

(*c*) What is half-wave potential in polarography ? Explain its importance.

(*d*) Describe Lindemann's theory of unimolecules reactions.

P.T.O.

2. Attempt the following : 20

(*a*) Derive Gibbs adsorption isotherm. Explain in detail its significance.

(*b*) What is current exchange density ? Explain Tafel Plot.

3. Solve : 20

(*a*) Write an account on liquid crystal polymers. Discuss an Osmometry method of molecular weight determination of polymers.

(*b*) What is Differential method for determination of order of a reaction ?

At a certain temperature the half-life periods for the catalytic decomposition of ammonia were found to be as :

$p_{(\text{mm of Hg})}$	50	100	200
$t_{1/2\ (\text{min})}$	3.52	1.92	1.01

Find out order, n

4. Solve the following : 20

(*a*) State BET equation for multilayer adsorption and explain its significance. How is it used for the estimation of surface area of an adsorbent.

(*b*) What is intrinsic viscosity ? The intrinsic viscosity of a solution of polyisobutylene at 20°C is 180 cm^3/gm. If $[\eta]$ is related to viscosity-average molar mass by equation, $[\eta] = 3.60 \times 10^{-2}\ [m]^{0.629}$ calculate the molar mass of polymer.

5. Solve : 20

(*a*) Derive Butler-Volmer equation of electrode kinetic reactions.

(*b*) What is enzyme catalysis ? Derive Michaelis-Menten equation and explain its importance.

6. Write short notes on the following : 20

(*a*) Surface films on liquids

(*b*) Corrosion monitoring and its prevention methods

(*c*) Kinetics of pyrolysis of acetaldehyde

(*d*) Electrically conducting and fire resistant polymers.