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NEPWT—165—2024

FACULTY OF SCIENCE

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

NOVEMBER/DECEMBER, 2024

CHEMISTRY

Paper SCHEC-453

(Physical Chemistry—II)

(Monday, 16-12-2024) **Time : 10.00 a.m. to 1.00 p.m.**

Time—3 *Hours* *Maximum Marks*—80

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

(2) Solve any *three* questions from Q. No. **2** to Q. No. **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 is Micellisation ? Explain thermodynamics of micellisation.

(*b*) A protein sample has an equimolar mixture of heamoglobin (M_1 = 15.5 kg mol^{-1}), ribonuclease (M_2 = 13.7 kg mol^{-1}) and myoglobin (M_3 = 17.2 kg mol^{-1}). Calculate $\bar{M}_N$ and $\bar{M}_M$. Which is greater ?

(*c*) Derive the Ilkovic equation of diffusion current in polarographic cell.

(*d*) What are fast reactions ? Explain :

(*i*) Flash photolysis, and

(*ii*) NMR method.

P.T.O.

2. Solve the following : 20

(*a*) Derive BET equation of multilayer adsorption and state its importance.

(*b*) What is overpotential ? Explain in detail :

(*i*) Hydrogen over-voltage, and

(*ii*) Oxygen overpotential.

3. Solve the following : 20

(*a*) What are :

(*i*) isotactic

(*ii*) atactic, and

(*iii*) syndiotactic polymer ?

Explain Osmometry method of determination of molar masses of polymers.

(*b*) What are oscillatory reactions ? The half-life for the radioactive decay of ^{14}C is 5730 years. An archaeological artifact containing wood had only 80% of the ^{14}C found in living tree. Estimate the age of the sample.

4. Attempt the following : 20

(*a*) The intrinsic viscosity of a solution of polyisobutylene at 20°C is 1.80 decilitre per gram and molecular weight is 6.0×10^5 gm per mole. Determine constant k if $a = 0.64$.

(*b*) Write an account on surface films on liquids and catalytic activity at surfaces.

5. Solve the following : 20

(*a*) What is basic principle of Polarography ? Explain half-wave potential and any *three* applications of polarography.

(*b*) Describe the kinetics of a reaction, decomposition of Ethane.

6. Write short notes on the following : 20

(*a*) Surface active agents and its classification

(*b*) Butler-Volmer equation and its significance

(*c*) Michaelis-Menten equation and its importance in enzyme catalysis

(*d*) (*i*) Polymers and macromolecules

(*ii*) Liquid crystal polymers.