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WT—210—2024

FACULTY OF SCIENCE

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

NOVEMBER/DECEMBER, 2024

(CBCS/New Pattern)

CHEMISTRY

Paper II (CH-423)

(Physical Chemistry)

(Monday, 16-12-2024)   **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 log table and calculator is allowed.

Given :

R = 845.67 mm H_2O dm^3/K/mole.

1.   Solve any *three* :   15

    (*a*)   (*i*)   Explain differential method for determing rate laws.

        (*ii*)   The $t_{1/2}$ of a reaction is halved as the initial concentration of the reactant is doubled. What is the order of reaction ?

    (*b*)   What are fast reactions ? Explain NMR method.

P.T.O.

(*c*) A protein sample consists of equimolar mixture of haemoglobin (M = 15.5 kg/mole), ribonuclease (M = 13.7 kg/mole) and myoglobin (M = 17.2 kg/mole). Calculate $M_{\bar{N}}$ and $M_{\bar{M}}$. Which is greater ?

(*d*) Write an account on 'Oscillatory reactions'.

(*e*) The plot of π/c *Vs c* extrapolated to zero concentration for osmotic pressure measurements of γ-globulin in 0.15 M NaCl at 35°C is 1.86 mm H_2O dm^3gm^{-1}. Calculate molecular weight of the polymer.

2. Attempt any *three* : 15

(*a*) What is Tafel plot ? How transfer coefficient is determined from it ?

(*b*) Explain the applications of polarography for determination of stability constant of metal-ion complex.

(*c*) What are polymerisation reaction ? Explain the mechanism of free radical polymerisation of styrene.

(*d*) State Ilkovic equation in polarography and explain its significance.

(*e*) What is zeta-potential ? Explain the theory of double layer at semiconductor solution interface.

3. Attempt the following :

(*a*) Derive Gibbs adsorption isotherm. Explain its significance. 7

Or

Describe viscometry method for molar mass determination of polymers.

(*b*) Explain the kinetics of electrode reactions and derive Butler-Volmer equation. 8

Or

State postulates of transition-state theory of reaction rates. Derive the rate constant expression with thermodynamic formulations.

4. Attempt the following :

(*a*) What are ionic reactions ? Explain salt effects. 7

Or

(*i*) What is meant by over-voltage ? Explain its types.

(*ii*) Explain corrosion monitoring and prevention methods.

(*b*) What are surface active agents ? Explain the classification of surface active agents with examples. 8

Or

Describe kinetics of pyrolysis of acetaldehyde.

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

(*i*) Lindemann hypothesis

(*ii*) Effect of light at semiconductor solution interface

(*iii*) BET equation and estimation of surface area

(*iv*) Thermodynamics of Micellisation-phase separation and mass action models.