BR—292—2016

FACULTY OF SCIENCE

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

NOVEMBER/DECEMBER, 2016

(CBCS Course)

CHEMISTRY

Paper VII (CH-423)

(Physical Chemistry)

(Tuesday, 22-11-2016)   **Time : 10.00 a.m. to 1.00 p.m.**

Time—Three Hours   *Maximum Marks—75*

N.B. :— (i) Attempt *All* questions.

     (ii) Use of logarithm table and calculator is allowed.

     (iii) Solve Q. No. 5 (A) at once only :

         $R = 8.314 \ JK^{-1} \ mol^{-1}$.

         $h = 6.626 \times 10^{-34} \ Js$.

         $R = 0.0820 \ lit \ atm \ K^{-1} \ mol^{-1}$.

1. Solve any *three* of the following :   15

(a) Define overpotential. Discuss the factors affecting overpotential.

(b) Define surface tension. Give its unit. Derive Laplace equation for curved surface.

(c) Derive Arrhenius equation.

(d) The intrinsic viscosity of isobutylene in CCl_4 solution at 30°C is 0.78 decilitre per gm. If $k = 2.6 \times 10^{-4}$ and $a = 0.70$ determine the molecular weight of the polymer.

(e) Discuss the kinetics of pyrolysis of acetaldehyde.

P.T.O.

2. Attempt any *three* of the following : 15

    (*a*) Discuss the kinetics of addition polymerization.

    (*b*) Give an account of flash photolysis.

    (*c*) How will you determine the molecular weight of a polymer by light scattering method ?

    (*d*) What is corrosion ? Explain the factors affecting corrosion.

    (*e*) What is half wave potential ? Give its significance.

3. Attempt the following :

    (*a*) What is adsorption isotherm ? Derive Gibbs' adsorption isotherm. 8

Or

Discuss the kinetics of reaction between H_2 and Cl_2.

    (*b*) Explain the different types of corrosion. Give an account of corrosion inhibitors. 7

Or

Define $\langle M_M \rangle$ and $\langle M_N \rangle$. Determine $\langle M_M \rangle$ and $\langle M_N \rangle$ of a polymer sample containing equal number of molecules with $M_1 = 20,000$ and $M_2 = 2,00,000$.

4. Attempt the following :

    (*a*) Define order of reaction. How will you determine the order of reaction from differential method. In the reduction of nitric oxide 50% of the reaction was complete in 140 seconds when the initial pressure was 258 mm of Hg and in 224 seconds when the initial pressure was 202 mm of Hg. Find the order of reaction. 8

Or

For a first order reaction, the rate constant is found to be 6×10^{-6} at 10°C and 8×10^{-4} at 55°C. Calculate the energy of activation and the specific reaction rate at 120°C.

(b) Derive Butler-Volmer equation. 7

Or

What are surface active agents ? Explain the different types of surface active agents. Discuss the factors affecting CMC.

5. (A) Select the *correct* alternative from the following MCQs : 5

(i) If the reacting ions have the same charge ($Z_A Z_B$) either positive or negative, then with increasing ionic strength the rate of reaction ....

(a) increases (b) decreases

(c) remains unaffected (d) very little effect

(ii) In liquids, the surface molecules are associated with .... energy and molecules in the bulk are associated with .... energy.

(a) lower, lower (b) lower, higher

(c) higher, lower (d) higher, higher

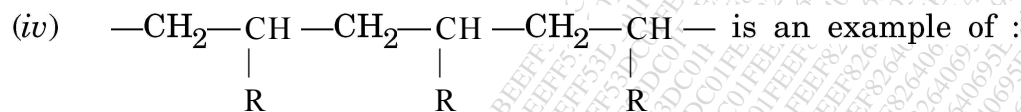(iii) Which of the following is not correct for first order reaction ?

(a) Rate = K[Reactant]^1 (b) $t_{\frac{1}{2}} \propto [\text{Reactant}]_0^0$

(c) $t_{\frac{1}{2}} \propto \dfrac{1}{[\text{Reactant}]_0}$ (d) $t_{\frac{1}{2}} \propto \dfrac{1}{[\text{Reactant}]_0^0}$

where [Reactant]$_0$ is initial concentration.

P.T.O.

(iv) $-CH_2-CH-CH_2-CH-CH_2-CH-$ is an example of :

          | | |

          R   R   R

    (a)   Isotactic Polymer   (b)   Atactic Polymer

    (c)   Syndiotactic Polymer   (d)   Stereoregular Polymer

(v)   An .... in temperature .... the corrosion.

    (a)   increase, increase   (b)   increase, decrease

    (c)   decrease, increases   (d)   decrease, decrease

(B)   Write short notes on any *two* of the following :   10

(a)   Estimation of surface area from BET adsorption isotherm

(b)   Condensation polymerisation

(c)   Flow method for the study of fast reactions.