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AI—234—2017

FACULTY OF SCIENCE

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

MARCH/APRIL, 2017

(CBCS Pattern)

CHEMISTRY

Paper CH-423

(Physical Chemistry)

(Wednesday, 26-4-2017)

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

Time—3 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.

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

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

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

1. Solve any *three* of the following : 15
 - (a) What is overpotential ? Explain the types of overpotential.
 - (b) Explain how will you determine surface area of adsorbent by using BET equation.
 - (c) Discuss collision theory of reaction rates.
 - (d) The intrinsic viscosity of a solution of polyisobutylene at 20°C is 1.80 decilitre per gm and molecular weight is 6.0×10^5 gm per mol. Determine the constant K if $a = 0.64$.
 - (e) Discuss the kinetics of decomposition of ethane.
2. Attempt any *three* of the following : 15
 - (a) What are surface active agents ? Give their classification.

P.T.O.

- (b) Explain nuclear magnetic resonance method for the study of kinetics of fast reactions.
- (c) What is polymerization ? Explain the different types of polymers.
- (d) State Ilkovic equation. Give its significance.
- (e) What is corrosion ? How is it controlled ?

3. Attempt the following :

- (a) Derive Gibbs' adsorption isotherm. Give its significance. 8

Or

Give the postulates of transition state theory. Explain it using thermodynamics.

- (b) Derive Butler-Volmer equation. 7

Or

Define $\langle M_m \rangle$ and $\langle M_n \rangle$. If for a particular polymer sample 50 molecules would have molecular weight 5000, 100 molecules would have molecular weight 50,000 and 200 molecules would have molecular weight 1,00,000. Calculate the number average and mass average molecular weights.

4. Attempt the following :

- (a) Define chain reactions. Discuss the kinetics of reaction between Hydrogen (H_2) and Bromine (Br_2). 8

Or

Explain fractional change method for the determination of order of reaction. At a certain temperature, the half life periods for the catalytic decomposition of ammonia were as follows :

Pressure (mm of Hg)	Relative half life period (min)
50	3.52
100	1.82
200	0.95

Find the order of the reaction.

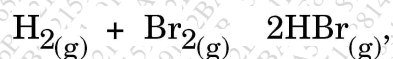
- (b) What is the principle of polarography ? What are the advantages and disadvantages of Dropping Mercury electrode ? Give any *three* applications of polarographic technique. 7

Or

Describe osmotic pressure method for the determination of molecular weight of polymer. If $\lim_{c \rightarrow 0} \frac{\pi}{c} = 3 \times 10^{-6} \text{ atm g}^{-1}$ for a series of dilute solutions of a polymer when osmotic pressure measurements were carried out at 20°C.

5. (A) Select the *correct* alternatives from the following MCQ's : 5

- (i) For the reaction,



the experimental data suggests that :

$$\text{rate} = K[\text{H}_2] [\text{Br}_2]^{\frac{1}{2}}$$

The molecularity and order of reaction are respectively :

- (a) 1, 1
 (b) 2, 1
 (c) 2, $\frac{1}{2}$
 (d) 2, $\frac{3}{2}$
- (ii) If a solute is positively adsorbed from the solution on the surface of adsorbent, the surface tension of solution :
- (a) decreases
 (b) increases
 (c) vanishes
 (d) may be +ve or -ve

P.T.O.

- (iii) The first order rate constant for dissociation of N_2O_5 is $6.93 \times 10^{-2} \text{ s}^{-1}$. The half life period for this dissociation will be :
- (a) One second
 - (b) Ten second
 - (c) Hundred second
 - (d) Thousand second
- (iv) If polymers have random sequence of d and l configurations, the polymer is :
- (a) Isotactic
 - (b) Stereoregular
 - (c) Syndiotactic
 - (d) Atactic
- (v) The factor/s responsible for soil corrosion is/are :
- (a) Acidity of soil
 - (b) Moisture content
 - (c) Micro-organisms present
 - (d) All of the above
- (B) Write short notes on any *two* of the following :
- (i) Critical Micelle concentration
 - (ii) Catalytic activity at the surface
 - (iii) Arrhenius equation.

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