

Third Semester B. Tech. (Food, Pulp and Paper, Oil and Paint, Petro Tech.) (CGS)
Examination

APPLIED PHYSICAL CHEMISTRY - II

Paper - 3 CT 02

(USC - 11002)

P. Pages : 4

Time : Three Hours]

[Max. Marks : 80

- Note :**
- (1) Separate answer book must be used for each section in the subject Geology, Engineering material of Civil branch and separate answer book must be used for Section A and B in pharmacy and Cosmetic Tech.
 - (2) Answer **Three** questions from Section A and **Three** questions from Section B.
 - (3) Due credit will be given to neatness and adequate dimensions.
 - (4) Assume suitable data wherever necessary.
 - (5) Illustrate your answer wherever necessary with the help of neat sketches.
 - (6) Discuss the reaction, mechanism wherever necessary.
 - (7) Use pen of Blue/Black ink/refill only for writing the answer book.

SECTION A

1. (a) Discuss the determination of molecular weight of polymer by light scattering method. 5
- (b) Write the principle of sedimentation equilibrium method. 4
- (c) Explain how properties of polymer changes with structure 4

OR

2. (a) Derive the formula for weight average molecular weight of macromolecules. 5
- (b) Define :—
 - (i) Osmosis. (ii) Intrinsic viscosity. 4
- (c) Explain with example extrinsically conducting polymers. 4

3. (a) State the principle of potentiometric titration. Explain the determination of neutralization point of titration between strong acid and strong base. 5
- (b) What is the effect of dilution of an electrolytic solution on specific and equivalent conductance? 4
- (c) The solubility of Ag Br at 298 K is $1.19 \times 10^{-6} \text{ moldm}^{-3}$. What is the standard EMF of a cell $\text{Ag}/\text{Ag}^+ (a) \parallel \text{Br}^- (a_1) \mid \text{AgBr}$? 4

OR

4. (a) Define :—
- (i) Specific conductance (ii) Cell constant. 4
- (b) What is electrolytic concentration cell with transference? Derive an expression for EMF of concentration cell with transference. 5
- (c) The emf of concentration cell $\text{Pb} \mid \text{PbSO}_4 \mid \text{CuSO}_4 (a_{\pm} = 0.022) \parallel \text{CuSO}_4 (a_{\pm} = 0.0064) \mid \text{PbSO}_4 \mid \text{Pb}$ is 0.0118 V at 298 K. Calculate the transference number of the copper ions. 4
5. (a) Explain Carnot cycle and derive equation for efficiency of heat engine. 6
- (b) State the second law of thermodynamics. 4
- (c) Show that $TV^{(r-1)} = \text{constant}$; where $r = \frac{C_p}{C_v}$. 4

OR

6. (a) One mole of an ideal gas ($C_v = 12.55 \text{ JK}^{-1} \text{ mol}^{-1}$) at 300 K is compressed adiabatically and reversibly to one fourth of its original volume. What is the temperature of the gas? ($R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$). 4
- (b) What is Gibb's free energy? Derive Gibb's Helmholtz equation. 6
- (c) Define :—
- (i) Chemical potential (ii) Work function. 4

SECTION B

7. (a) What is quantum yield ? How is it determined experimentally ? 6
(b) Distinguish between photo-chemical reaction from thermal reaction. 3
(c) Give the application of IR spectroscopy. 4

OR

8. (a) Define :—
(i) Rigid rotator (ii) Photosensitization 3
(b) State Beers law and show that, $I = I_0 e^{-\alpha c x}$ where α = molar absorption coefficient and X = thickness of medium. 4
(c) Derive an expression for wave number of microwave active heterodynamic molecule. <http://www.sgbauonline.com> 6

9. (a) Show that :—
 $t_{1/2} \propto \frac{1}{a}$; for second order reaction. 5
(b) Write the characteristics of zero order reaction. 5
(c) Define K_p and K_x and derive their inter-relation. 4

OR

10. (a) Half-Life disintegration of radium is 1590 years. Calculate the rate constant in S^{-1} and also how many years will be taken for disintegration of 70%. 5
(b) Give the Ostwald's isolation method. 3
(c) Derive an integrated rate equation of specific rate constant for second order reaction in which reactants have unequal initial concentration. 6
11. (a) State the important characteristics of catalyst. 5
(b) Derive BET equation. 5

(c) Define :---

(i) Autocatalysis

(ii) Chemisorption.

3

OR

12. (a) Distinguish between homogeneous and Heterogeneous catalyst

4

(b) Derive the expression for Langmuir isotherm.

5

(c) Explain acid base catalysis.

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