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R – 6213

Reg. No. : ....

Name : ....

First Semester M.Sc. Degree Examination, May 2023

Chemistry/Polymer Chemistry/Analytical Chemistry

CH 213/ CL 213/ PC 213: PHYSICAL CHEMISTRY – I

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 75

SECTION – A

Answer any **two** among (a), (b) and (c) from each questions. Each sub question carries **2** marks.

1. (a) Define laplacian operator.

   (b) What are hermite polynomials?

   (c) Write the recursion formula.

2. (a) What are surface films?

   (b) What is enzyme catalysis?

   (c) Give the expression for freundlich adsorption.

3. (a) Define fugacity

   (b) State henry's law.

   (c) Give the duhem-Margules equation.

P.T.O.

4. (a) What are termolecular reactions?

   (b) Mention are any two relaxation techniques to monitor rapid reactions.

   (c) What is primary salt effect?

5. (a) What are symmetry elements?

   (b) What is similarity transformation?

   (c) What are abelian groups?

<div align="right">(10 × 2 = 20 Marks)</div>

SECTION – B

Answer either (a) or (b) from each questions. Each sub question carries **5** marks.

6. (a) Give the important postulates of quantum mechanics.

   (b) Calculate the lowest energy transition of an electron confined to a 1D-box of infinite potential path.

7. (a) Discuss the theories of catalysis.

   (b) Describe any two instrumental techniques for surface analysis.

8. (a) Derive any two Maxwell's relations.

   (b) Derive Van't Hoff equation.

9. (a) Discuss the Lindemann-Christiansen hypothesis for the treatment of unimolecular reactions.

   (b) With schematic diagram, explain how laser flash photolysis is helpful in monitoring the fast reactions.

10. (a) Construct the character table for C_{2v} point group.

    (b) Write the 3x3 matrix representations of all the symmetry elements.

<div align="right">(5 × 5 = 25 Marks)</div>

Answer any **three** questions. Each question carries **10** marks.

11. Write the Hamiltonian for a simple harmonic oscillator and get the complete wave functions by solving the schrodinger wave equation.

12. Discuss the kinetics of Langmuir adsorption isotherm.

13. (a) Define chemical potential.

 (b) Derive Gibbs – Duhem equation.

 (c) Describe ant two methods for the determination of partial molar properties.

14. How will you obtain the three-halves and one-half order kinetics for a chain reaction? Derive the rate expression and equations for the chain length.

15. Show that the hybridization in methane is sp^3, using group theory.

(3 × 10 = 30 Marks)