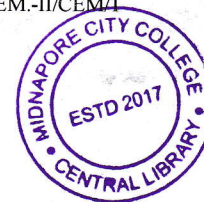


**PG CBCS**  
**M.Sc. Semester-II Examination, 2022**  
**CHEMISTRY**  
 PAPER: CEM 201  
**(PHYSICAL CHEMISTRY - II)**



Full Marks: 40

Time: 2 Hours

**GROUP - A****1. Answer any four questions from the following questions: 2×4 = 8**

- a) What is relaxation time in a chemical reaction?
- b) What are oscillatory chemical reactions?
- c) What is a micelle?
- d) What are micro emulsions? Give example.
- e) Using atomic units, write the expression for the Hamiltonian for the electronic motion of hydrogen atom in spherical coordinates.
- f) Write the radial and angular parts of hydrogen atom in spherical coordinates.

**GROUP - B****2. Answer any four questions from the following questions: 4×4 = 16**

- a) Explain Rayleigh line, Stokes lines, and anti-Stokes lines in the Raman spectrum.
- b) For a consecutive reaction,  $A \xrightarrow{k_1} B \xrightarrow{k_2} C$  calculate the time when concentration of B,  $C_B$  will be maximum.
- c) Describe the rotation-vibrational Raman spectrum obtained for a diatomic molecule.
- d) Explain the following in electronic spectroscopy:  
 (I) Vibrational Relaxation, (II) Internal Conversion, (III) Intersystem Crossing, (IV) Phosphorescence
- e) Discuss the different types of enzyme inhibitions.
- f) Discuss the inner sphere and outer sphere mechanism of a redox reaction with examples.

**GROUP - C****3. Answer any two questions from the following questions: 8×2 = 16**

- a) Starting from the Schrödinger equation for the Hydrogen atom

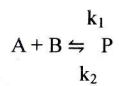
$$\left[ -\frac{\hbar^2}{8\pi^2 m_e} \nabla_e^2 - \frac{\hbar^2}{8\pi^2 m_n} \nabla_n^2 - \frac{ze^2}{4\pi\epsilon_0 r} \right] \psi = E\psi$$

Deduce the Electronic Schrödinger equation for the Hydrogen atom in spherical polar coordinates.

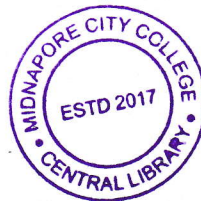
(P.T.O.)

(2)

- b) Derive an expression for relaxation time of the reaction



- c) (I) Give an example of Auto Catalytic Reaction.  
(II) Derive an expression for Michaelis Constant for homogeneous enzyme catalysis reaction. 2+6
- d) Describe the method for the precise determination of dissociation constants of weak electrolytes by the method of conductance measurements.



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