A-0555

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MSCCH–508

M.Sc. CHEMISTRY (MSCCH)

(Physical Chemistry–II)

2nd Semester Examination, Session December 2024

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

Long Answer Type Questions 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. Derive Schrödinger wave equation to a system of harmonic oscillator. 19

2. Discuss and derive Gibbs adsorption isotherm. 19

3. (a) Discuss classification of polymers with suitable examples. 11

   (b) How do you obtain molecular weight of a molecular weight from sedimentation method ? 8

4. (a) Derive an expression for the energy of a rigid rotor using Schrödinger wave equation. 11

   (b) Calculate the wavelength (in nanometres) of a H atom (mass = 1.674×10^{-27} kg) moving at 698 cm/s. 8

5. Formulate the Schrodinger wave equation for the hydrogen atom and separate into Y, Θ and ϕ equations. 19

Section–B

Short Answer Type Questions 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Discuss and derive de Broglie equation.

2. Discuss postulates of quantum mechanics.

3. Determine which of the following functions are eigen functions of the operator d^2/dX^2 :

   (i) Cos X

   (ii) kX

4. What is adsorption ? Discuss Freundlich adsorption isotherm.

5. How do you determine surface area of a catalyst using BET equation ?

6. Discuss the conditions of normalization.

7. Depict and explain types of adsorption isotherms.

8. Calculate ΔE between the $n = 4$ and $n = 5$ states for a F_2 molecule trapped within in a one-dimension well of length 3.0 cm.

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