A–0986

Total Pages : 3 **Roll No. .....**

MSCCH-508

M.Sc. Chemistry (MSCCH)

Physical Chemistry-II

Examination February, 2026

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. (a) An e^- is confined in a 1–D box of the length 1 Å. Calculate is around state energy in electron volt. (11)

   (b) Derive the schrodinger wave equation. (8)

2. Write BET equation. What are its limitations ? Discuss how BET equation is used in the determination of surface area of solids. (19)

3. (a) Describe Cartesian and polar coordinates. How are they related ? (8)

   (b) Describe rigid rotor with fixed axis. Discuss in brief how Schrödinger wave equation is used to calculate the energy of rigid rotor. (11)

4. What is harmonic oscillator ? Explain quantum model of harmonic oscillator. Derive $E_n = (n + ½)\ h\nu$ for a harmonic oscillator. (19)

5. What are polymers ? Write a note on classification of polymers ? What is polydispersity index of a polymeric sample ? (3+10+6)

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. Write brief notes on the following :

   (a) Relative viscosity and intrinsic viscosity

   (b) Derivation of de Broglie's equation (4+4)

2. Discuss the following :

   (a) Hamiltonian operator and its properties

   (b) Orthogonal and orthonormal wave functions (4+4)

3. State and explain eigen function and eigen values with suitable examples. (8)

4. Write postulates of quantum mechanics. (8)

5. What is adsorption isotherm ? Discuss about Freundlich adsorption isotherm. (8)

6. Differentiate between number average M_n and wright average M_w molar mass of macromolecules. Explain why M_w is always greater than or equal to Mn for a polydisperse polymer sample. (8)

7 What are liquid crystals ? What are criteria for a molecule to be a liquid crystalline ? (8)

8. Define the terms adsorption. Explain the different effects of temperature on physisorption and chemisorption, referencing the spontaneity of the process. (8)

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