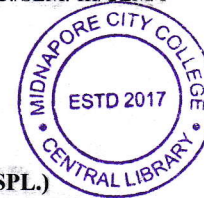Total pages: 02

PG CBCS
M.Sc. Semester-III Examination, 2022
CHEMISTRY
PAPER: CEM 303
(ADVANCED PHYSICAL CHEMISTRY-II: PHYSICAL SPL.)
Full Marks: 40   **Time: 2 Hours**

GROUP – A

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

   a) Define geometrical structure factor of a crystal.

   b) Define Hall Effect in metals.

   c) Define Lattice vibration.

   d) What are Schottky defects?

   e) Why does the conductivity of a semiconductor increase with an increase in temperature?

   f) State the principle of microscopic reversibility.

   g) Define phase space.

   h) Define the terms

      (i) Ensemble average and

      (ii) Time average for the square of coordinate of an ensemble.

GROUP - B

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

   a) Discuss the different types of ensembles.

   b) Discuss Laue's diffraction.

   c) Discuss point, line, and plane defects in solids.

   d) Obtain the equilibrium concentration of Schottky defect and Frenkel defect in a crystal.

   e) What are oscillatory chemical reactions? Discuss any one model to explain the mechanism of which reactions.

   f) Explain the working principle of an n-p junction semiconductor.

   g) Obtain the expression for entropy in terms of molecular partition function and internal energy.

   h) Derive the expression for the molar rotational partition function for a homonuclear diatomic molecule.

(1)

(P.T.O.)

GROUP - C

3. **Answer any <u>two</u> questions from the following questions:**   **8×2 = 16**

    a) Obtain the expression for electrical conductivity based on quantum free electron theory. What are the drawbacks in classical free electron theory and explain how quantum free electron theory overcomes the drawbacks?   (5+3)

    b) Define Canonical ensemble. Obtain the Gibbs Canonical Distribution. (2+6)

    c) Define partition function. Assuming, without derivation, the expressions for Hamilton's equations of motion; derive Liouville's equation.   (2+6)

    d) What is meant by the Bose-Einstein condensation? Obtain the expression for the temperature at which such a phenomenon occurs.   (2+6)

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