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MSCPH-506

Condensed Matter Physics

M.Sc. Physics (MSCPH)

2nd Semester Examination, 2022 (Dec.)

Time : 2 Hours] **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.

SECTION–A
(Long Answer Type Questions)

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.

(2×19=38)

1. Explain the concept of Millar indices. With the help of diagram, find out the Millar indices of a simple cubic crystal.

2. What is reciprocal lattice? How we construct a reciprocal lattice? Give its properties.

3. What are primary bonds and secondary bonds? Give the difference.

4. What are dislocations? Classify different type of dislocations. Explain edge and screw dislocations with the help of diagram.

5. Derive expression for different modes of vibrations of diatomic linear chain of atoms.

SECTION–B

(Short Answer Type Questions)

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. (4×8=32)

1. What are Bravais lattices? Explain seven types crystal systems and draw possible Bravais lattice in three dimensional space.

2. Show that reciprocal of fcc is bcc.

3. What are Scottky and Frenkel diffect?

4. What are phonons? Give the properties of phonon.

5. In Debye model of heat capacity, explain the behaviour of solids at low temperature and high temperature.

6. What is the value of mean energy in terms of Fermi energy at absolute zero?

7. The semiconductor has 6×10^{19} electrons and 7×10^{20} holes/m^3. If the mobilities of electrons and holes are 0.10 m^2/V s and 0.06 m^2/V s respectively. Calculate the conductivity of the semiconductor.

8. Obtain Clausius-Mosotti equation and explain how it can be used to determine the dipole moment of a polar molecule from dielectric measurement.
