

[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7861

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Unique Paper Code : DSE- 2173540023

Name of the Paper : Crystalline Solids: Properties and Methods of Analysis

Name of the Course : B.Sc. (Prog.)

Semester : VIII

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **four** QUESTIONS in all.
3. All Questions carry equal marks.

1. (a) Explain primitive and non-primitive type of unit cells present in solids.
(b) Define the different elements of symmetry present in crystals. List the various elements of symmetry present in a cube.
(c) A reflection from (111) planes of a cubic crystal was observed at a glancing angle of 11.2° when X-rays of wavelength 154 pm were used. What is the length of the side of the unit cell? At what angle of reflection will take place from (123) planes?
(5, 5, 5)
2. (a) Sketch the first Brillouin zone for a simple cubic lattice. Explain their significance in band structure.
(b) Write a short note on Laue's method for X-ray diffraction by crystals.
(c) Draw a Williamson-Hall (WH) plot. What information can be obtained from the intercept and slope of a WH plot?
(5, 5, 5)
3. (a) Explain the temperature dependence of electrical conductivity in metals and semiconductors.
(b) Explain exchange interaction and how it leads to ferromagnetism and antiferromagnetism.
(c) Define the term Miller indices. A face makes intercepts 3a and 2c on the X-axes and Z-axes respectively and does not cut the Y-axes at all. What are the Miller indices of the face?
(5, 5, 5)

P.T.O.

4. (a) Briefly describe Powder method and its advantages over Bragg's method?
(b) Explain the difference between conductors, semiconductors, and insulators using energy band diagrams.
(c) Discuss orbital contribution to magnetic moment.
(5, 5, 5)
5. (a) What is magnetic susceptibility? How does it vary with temperature?
(b) Give a brief account of paramagnetism, ferromagnetism, ferrimagnetism, antiferromagnetism.
(c) Both NaCl and KCl have similar structures, yet their X-ray diffraction patterns are remarkably different. Why?
(5, 5, 5)
6. Define the following terms.
(a) Bohr magneton
(b) Conductors
(c) Neel temperature
(d) Crystal lattice & Interfacial angle
(e) Spin magnetic moment of Ni^{2+} , Cu^+ ions
(3, 3, 3, 3, 3)