

[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7264

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Unique Paper Code : 2173550014

Name of the Paper : DSE - Fundamentals of Solid State and Materials Chemistry

Name of the Course : **B.Sc (Hons)**

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 **FOUR** question in all. Question **1** is compulsory. **All** the questions carry equal marks.

Q1. Give reasons why (Do Any 5):

(3 × 5 = 15)

- (a) Five fold rotational symmetry is forbidden in periodic crystals but observed in quasicrystals.
- (b) Insulators are characterized by large band gaps.
- (c) Heavier atoms scatter X-rays more strongly.
- (d) Amorphous solids do not give sharp diffraction peaks.
- (e) NMR requires an external magnetic field.
- (f) UV-Vis spectroscopy is useful for studying electronic transitions.

Q2. (a) Explain Bravais lattices and crystal systems. Discuss the essential symmetry elements involved in each crystal system.

(b) What are nanomaterials? Give at least four characteristic properties that set them apart from other materials.

(c) Discuss any two methods of synthesis of nanomaterials with suitable example

(i) Sol gel (ii) Hydrothermal (iii) Colloidal synthesis (5,5,5)

P.T.O.

- Q3. (a) Derive Bragg's law and explain its application in PXRD.
(b) What is electron microscopy? Discuss the process involved in the interaction of high energy electron with matter in electron microscopy.
(c) Define magnetic hysteresis? Draw a typical Hysteresis loop. (5,5,5)
- Q4. (a) Discuss quantum confinement in nanomaterials. Explain its effect on properties and applications with examples.
(b) Explain how overlap of atomic orbitals leads to band formation of solids.
(c) What is Curie and Curie-Weiss law? States its limitations. (5,5,5)
- Q5. (a) Derive Beer Lambert's Law and discuss its deviations.
(b) What are quantum dots? Discuss their applications.
(c) (i) How will you measure the chemical shift (δ) and why tetramethyl silane is used as a reference?
(ii) How will you distinguish 1,3- pentadiene and 1,4- pentadiene using UV-spectroscopy? (5,5,5)
- Q6. Write short notes (any three):
(i) Close packed Structures
(ii) Differential Thermal Analysis (DTA)
(iii) Miller Indices
(iv) Single Crystal X-Ray Diffraction (5,5,5)