

[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7941

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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.
3. Question 1 is compulsory.
4. **All** the questions carry equal marks.

Q1. Give reasons why (Do any 5):

(3 × 5 = 15)

- (a) Cubic Symmetry exhibits higher symmetry than triclinic systems.
- (b) PXRD is called a fingerprint technique.
- (c) NaCl adopts 6:6 coordination and CsCl adopts 8:8.
- (d) Some vibrational modes are IR inactive.
- (e) Diffraction occurs only at specific angles.
- (f) Peak broadening occurs in nanocrystalline materials.

Q2. (a) What is Bragg's Law? Explain all the terms involved in it.

- (b) Differentiate between solid state reaction and wet chemical synthesis routes for synthesis of nanomaterials.
- (c) How can you distinguish between paramagnetic, ferromagnetic, ferrimagnetic and antiferromagnetic materials ?

(5,5,5)

P.T.O.

Q3. (a) Discuss IR spectroscopy: principle, molecular vibrations and applications.

(b) What are electronic transitions in UV-Visible Spectroscopy ? Discuss various types of electronic transitions.

(c) Explain Powder X-Ray Diffraction with instrumentation and applications. (5,5,5)

Q4. (a) Explain SEM and TEM with working principles and applications. Compare both Techniques.

(b) Discuss the advantages and disadvantages of the Top down and Bottom up approach to prepare different kinds of nanomaterials ?

(c) Discuss the deshielding and shielding in Nuclear Magnetic Resonance (NMR) spectroscopy. (5,5,5)

Q5. (a) Explain the role of characterization techniques for bulk materials.

(b) What are thermal methods of analysis? Briefly discuss the various classification of thermal methods of analysis.

(c) (i) Define chromophore and Auxochrome with suitable examples.

(ii) Explain Williamson-Hall method to determine lattice strains from diffraction patterns. (5,5,5)

Q6. Write short notes (any three):

(i) Photoluminescence

(ii) Single Crystal X-ray Diffraction

(iii) Band theory of solids

(iv) Atomic Force Microscopy (AFM)

(5,5,5)