

Ex/SC/INSC/PG/CORE/TH/MI 304A/2024

M. Sc. INSTRUMENTATION SCIENCE EXAMINATION, 2024

(2nd Year, 1st Semester)

MATERIAL SCIENCE -II

PAPER : PG/CORE/TH/MI 304A

Time : Two Hours

Full Marks : 40

*Answer **any four** questions*

1. Deduce Bragg's equation in X-ray diffraction in crystal. Show that Bragg's equation is approximate to Laue's equation. What is the corrected form of Bragg's equation due to refraction?
5+3+2=10
2. What is geometrical structure factor? Derive an expression of geometrical structure factor of FCC crystal having Miller indices (h, k, l) and find the condition for diffraction maxima.
2+8=10
3. Write short notes on :
(a) Rietveld analysis
(b) Application of power method
5+5=10
4. What are nanostructured materials and quantum dots? Discuss the special properties of nanomaterials. Give salient features of nanotechnology.
4+3+3=10

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[Turn Over]

(2)

5. What do you mean by symmetry in crystal structure? What is point group in crystal symmetry? Describe all the possible symmetry elements in point group symmetry with proper diagram. Why among all the possible combination of symmetry elements only 32 point groups exist?
2+2+4+2=10
6. Describe the stereographic projection and its importance to describe the crystal symmetry. Draw the stereographic projection of a 4-fold axis and a mirror plane, when the plane of projection is perpendicular and parallel to the 4-fold axis and the mirror plane.
2+8=10
7. Define Bravais lattice and seven crystal system. What is primitive and non-primitive unit cell? What are the benefits for switching from primitive to non-primitive unit cell? Define Miller indices and how the habits of crystal growth are related to it?
3+2+1+4=10
8. (a) What is reciprocal lattice?
(b) Show that reciprocal lattice vectors of FCC lattice is same as BCC lattice but with different cell dimension.
2+8=10

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