SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai — 600 044.
M.Sc. - END SEMESTER EXAMINATIONS NOVEMBER - 2022
SEMESTER - III
20PPHET3003 - Crystal Physics

Total Duration : 2 Hrs 30 Mins. **Total Marks : 60**

Section A

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. What is heterogeneous nucleation? Show that the critical free energy change of the nucleus is lowered during heterogeneous nucleation.
2. Derive expressions for the critical values of the free energy and radius of a cylindrical nucleus.
3. Explain Braggs law in one dimension.
4. Explain how FTIR analysis is used to identify the functional groups of organic molecules.
5. Briefly explain the slow cooling and temperature gradient methods of crystal growth. What are the advantages of the temperature gradient method?
6. Write a short note on thermal characterization of materials.
7. Discuss the concept of reciprocal lattice.
8. Explain five membered and six membered rings.

Section B

Part A

Answer any **TWO** questions $(2 \times 10 = 20$ Marks)

9. Differentiate between homogeneous and heterogeneous nucleation.
   Derive expressions for the critical parameters of a disc shaped nucleus.
10. (i) Discuss the principle of liquid phase epitaxy.
    (ii) With neat diagrams discuss the tipping and sliding methods of crystal growth.
11. Explain the powder X-ray diffraction method used for the analysis of crystal structures.
12. Narrate the steps involved in crystal structure determination and discuss about WinGx software.

Part B

Compulsory question $(1 \times 10 = 10$ Marks)

13. Explain the various types of bonding in crystals. Illustrate with examples.

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