

(DPHY 24)

M.Sc. (Final) DEGREE EXAMINATION, JUNE 2010.

Second Year

Physics

Paper VIII — SOLID STATE PHYSICS – II

Time : Three hours

Maximum : 100 marks

Answer any FIVE questions.

All questions carry equal marks.

1. Explain the terms dielectric constant and polarizability. Explain the experimental determination of dielectric constants. Discuss the classical theory of electronic polarizability.
2. What are the salient features of ferroelectric materials? Discuss the classification of various ferroelectric materials with suitable examples. Distinguish between ferroelectric and ferromagnetic domains.
3. What are point defects? Derive an expression for Schottky defect concentration in ionic crystals. In NaCl crystal, the energy required to create a vacancy is 1.01 eV. Calculate the ration of vacancies at 300 K and 500 K.

4. Distinguish between edge and screw dislocations. Derive an expression for stress field around screw dislocation. Discuss the importance of Burger's vector in dislocations.
5. Obtain an expression for paramagnetic susceptibility of conduction electron. How do you achieve cooling by nuclear demagnetization?
6. Discuss Weiss theory of ferromagnetism. What are ferrites? Discuss their structure and properties.
7. What are magnons? Explain the thermal excitation of magnons. Explain Curie temperature in ferrimagnets and obtain an expression for their susceptibility.
8. Outline the salient features of BCS theory of superconductivity and explain how the BCS theory explain most of the fundamental properties of superconductors.
9. What are the peculiar properties of high T_c superconductors? Discuss the preparation and characterization of high T_c superconductors.
10. Write a note on any TWO of the following :
 - (a) Thermodynamic theory of ferroelectric transitions

- (b) Role of dislocations in crystal growth
 - (c) GMR-CMR materials
 - (d) Applications of piezoelectric crystals.
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