

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



B.Sc. DEGREE EXAMINATION – PHYSICS

SIXTH SEMESTER – APRIL 2016

PH 6610/PH 6606 – SOLID STATE PHYSICS

Date: 18-04-2016

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

PART –A

Answer ALL questions

(10x2 =20 Marks)

1. What is meant by a single crystal?
2. Determine the spacing between (1 0 0) planes and (1 1 0) planes in a NaCl crystal having the lattice constant of 5.64 Å.
3. Define Bragg's law of X-ray diffraction.
4. Write a note on neutron diffraction.
5. Mention the drawbacks of classical free electron theory.
6. State Gruneisen relation.
7. Give the applications of the free electron gas model.
8. What is Hall Effect?
9. What are the different types of superconductor?
10. Write a note on magnetic levitation.

PART –B

Answer any FOUR questions:

(4x7.5 =30 Marks)

11. Explain the various symmetry operations that are present in a crystal.
12. Obtain Laue's equations for X-ray diffraction by crystals.
13. Derive an expression for the thermal conductivity of a solid
14. State and explain the Wiedemann-Franz law.
15. Explain dc and ac Josephson effects.

PART – C

Answer any FOUR questions:

(4x12.5 =50 Marks)

16. Define crystal lattice and basis. Explain the seven crystal systems with suitable diagrams.
(4+8.5)
17. Describe the rotating crystal method to observe X – ray diffraction of any material. What are the uses of X –ray diffraction methods?
(10+2.5)

18. Derive an expression for specific heat of solid on the basis of Debye's model. How does the Debye model differ from the Einstein model? Discuss the variation of specific heat with temperature. (8.5+2+2)
19. Obtain an expression for the density of states for a free electron gas in three dimensions.
20. a) Discuss the qualitative description of the BCS theory.
- b) Calculate the temperature of photon that is just sufficient to break up Copper pairs in Mercury by a photon of energy 1.8×10^{-22} J. In what region of the electromagnetic spectrum are such photons found? (8+4.5)

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