



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

SIXTH SEMESTER – APRIL 2015

PH 6610/PH 6606- SOLID STATE PHYSICS

Date : 17/04/2015
Time : 09:00-12:00

Dept. No.

Max. : 100 Marks

PART A (10X 2 = 20)

Answer ALL questions

1. Define a unit cell.
2. Compare the density of lattice points in $\{132\}$ planes with that in $\{100\}$ planes for a cubic P lattice.
3. State Bragg's law of X-ray diffraction.
4. Determine the glancing angle on the cube face $\{100\}$ of a rock salt crystal corresponding to second order reflection. Given $a = 2.814 \text{ \AA}$ and $\lambda = 0.710 \text{ \AA}$.
5. What is specific heat?
6. Define thermal conductivity.
7. The collision time and root mean square velocity of electrons at room temperature are $2.5 \times 10^{-14} \text{ s}$ and 10^5 m/s respectively. Calculate the classical value of the mean free path of electron.
8. Define Hall field.
9. What is Meissner effect?
10. Mention the unique properties of a superconductor.

PART B (4 x 7.5 = 30)

Answer any FOUR questions.

11. Describe simple cubic; face centered cubic and the hexagonal close packed structure.
12. Describe powder method of crystal structure analysis.
13. Explain Debye model for specific heat capacity.
14. Explain free electron theory.
15. Enumerate the properties of type I and type II superconductors.
16. Explain thermal conductivity.

PART C 4 x 12.5 = 50)

Answer any FOUR questions

17. How many lattice system and types exist in crystals? Explain why a lattice with five fold symmetry is not possible?.
18. Derive Laue equations for X – ray diffraction by crystals..
19. Derive the expression for specific heat of solid using Einstein model..
20. Obtain Wiedemann – Franz law.
21. Explain BCS theory of superconductivity.
22. Obtain an expression for the Fermi energy of a free electron gas in three dimensions and deduce an expression for density of states.

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