



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

SIXTH SEMESTER – APRIL 2015

PH 6612 - SOLID STATE PHYSICS

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

Dept. No.

Max. : 100 Marks

PART – A

Answer ALL questions.

(10 x 2 = 20 marks)

1. Define lattice parameters and crystal symmetry.
2. Calculate the atomic packing factor of a face centered cubic structure.
3. What are Bragg's planes?
4. State any two advantages of Laue's method of X-ray diffraction.
5. State the expression for heat capacity according to classical theory.
6. Write the Gruneisen relation.
7. State Wiedemann Franz law.
8. Define density of states and write its expression.
9. What are Cooper pairs?
10. Explain any two applications of superconductivity.

PART – B

Answer any FOUR questions:

(4 x 7.5 = 30 marks)

11. What are Miller Indices? How are they obtained? Determine the Miller Indices of a set of parallel planes that makes an intercept in the ratio $4a:4b$ on the x and y axis and is parallel to z axis. (5+2.5)
12. Derive Bragg's law of X-ray diffraction. (7.5)
13. Explain Einstein's theory of specific heat of solids. (7.5)
14. Discuss the phenomenon of Hall effect in metals. (7.5)
15. Explain Meissner effect. Distinguish between Type 1 and Type 2 superconductors. (2.5+5)
16. Discuss Langevin's theory of paramagnetism of free electrons. (7.5)

PART C

Answer any FOUR questions:

(4 x 12.5 = 50 marks)

17. (a) Explain the point group symmetry elements exhibited by a crystal.
(b) Discuss the formation of point defects in crystals. (6.5+6)
18. (a) Explain with a diagram the experimental set up and the technique employed to determine the structure of micro crystals using Powder X-ray diffraction method. (12.5)
19. State the assumptions made by Debye and discuss how the specific heat varies as a function of T^3 at low temperatures. (2.5+10)
20. Obtain an expression for electrical conductivity of metals based on Sommerfeld's Model. (12.5)
21. (a) Explain Josephson Effect.
(b) Write a note on BCS theory of superconductivity. (5+7.5)
22. Describe with neat diagrams the seven crystal systems with reference to the lattice vectors and interfacial angles. Illustrate with suitable examples.

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