

CS/2051

Sheet 1

758/MH

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Total No. of Sheets Used: 02

Total No. of Questions: 09

Subject: B.Sc. Physics 6th Sem

Paper: I

Title of Paper: Paper-I: Condensed Matter Physics

Time Allowed: 3hrs

Maximum Marks: 30

Minimum Pass Marks: 11

Paper-I: Condensed Matter Physics

Time Allowed: 3 Hrs

Maximum Marks: 30

Note: The candidates are required to attempt two questions each from Section A and B carrying 5 marks each and five questions from Section C consisting of 7 short answer type questions carrying 2 marks each. Section C is compulsory.

Section –A

1. Discuss lattice vibrations. Distinguish between optical and acoustical branches of diatomic linear lattice. (5)
2. Discuss Einstein's theory of lattice heat capacity and explain why it is not capable of correct behaviour at low temperature. (5)
3. Derive expressions for fermi energy and density of state for free electron gas in one dimension. (5)
4. (a) What do you understand by Dulong and Petit's Law? What discrepancy was removed by Einstein? (3 1/2)
(b) If the Debye temperature of a solid is 1000K, what can we say about its room temperature specific heat? (1 1/2)

Section –B

5. Explain what are intrinsic semiconductors? Obtain and discuss the expression for electrical conductivity of an intrinsic semiconductor. Also derive the law of mass action for semiconductors. (5)
6. Discuss the essential features of the electron energy band structure on the basis of Kronig Penney model.
7. Give main postulates of BCS theory of superconductors. (5)
8. (a) Using normal isotopic effect, calculate the transition temperature of ^{202}Hg . Given that the transition temperature for ordinary mercury, of an atomic mass 200.59 is 4.153 K. (2 1/2)
(b) Define Doping, Dopant, Donor and Acceptor. (2 1/2) *Could be 2 r*

Sheet 2

Section -C

- (a) Differentiate between photons and phonons.
- (b) Name the commonly used semiconductors and their approximate energy band gap.
- (c) What are Extrinsic semiconductors? Give examples.
- (d) What are Cooper pairs?
- (e) Write an expression depicting isotope effect in superconductors.
- (f) What is Debye's temperature?
- (g) What is effective mass of an electron?

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