

Reg. No

Name

19P2032

MSc DEGREE END SEMESTER EXAMINATION - MARCH/APRIL 2019

SEMESTER 2 : PHYSICS

COURSE : 16P2PHYT07 : CONDENSED MATTER PHYSICS

(For Regular - 2018 Admission and Supplementary - 2017/2016 Admissions)

Time : Three Hours

Max. Marks: 75

Section A

Answer any 5 (1 marks each)

1. Rate of evaporation of a liquid does not depend upon
A. nature of liquid B. temperature
C. Atmospheric pressure D. Size of vessel.
2. Which of the following compounds is an example of network solid?
A. Corundum B. Carborundum
C. Dry ice D. Ice.
3. At room temperature a semiconductor material is
A. Perfect insulator B. Conductor
C. Slightly conducting D. Any one of the above.
4. In a metal
A. The electrical conduction is by electrons and holes
B. The conductivity decreases with the rise in temperature
C. The conduction band is empty
D. None of the above
5. In superconductivity the conductivity of a material becomes
A. Zero B. Finite
C. Infinite D. None of the above

(1 x 5 = 5)

Section B

Answer any 7 (2 marks each)

6. Draw and explain the structure of Graphite.
7. Write a note on electrical resistivity of metals?
8. Obtain the diffraction condition in terms of reciprocal lattice vectors.
9. What are degenerate levels?
10. Discuss the mobility of current carriers in semi-conductors
11. Distinguish between drift and diffusion phenomena in semi-conductors
12. Discuss the effect of temperature on mobility in the case of semi-conductors
13. Discuss the domain theory in the case of ferroelectrics?

14. Define coherence length for electrons in superconductors
15. What are quantum wires?

(2 x 7 = 14)

Section C

Answer any 4 (5 marks each)

16. State and prove any one of the properties of Reciprocal lattice.
17. Find the lowest energy of an electron confined to move in a three dimensional potential box of length 0.8 \AA .
18. The Hall coefficient of a certain silicon specimen was found to be $-7.35 \times 10^{-5} \text{ m}^3 \text{ C}^{-1}$ from 100 to 400 K. Determine the nature of the semiconductor. Further, the electrical conductivity was found to be $200 \Omega^{-1} \text{ m}^{-1}$. Calculate the density and mobility of charge carriers.
19. An intrinsic semiconductor material A has an energy gap 0.6 eV while material B has an energy gap 0.12 eV. Compare the intrinsic carrier densities in these two material at 300 K. Assume that the effective masses of all the electrons and holes are equal to the free electron mass.
20. A magnetizing field 100 A/m produces a flux density $4\pi \times 10^{-3} \text{ T}$ in a bar of material Calculate the relative permeability and susceptibility of the material ?
21. An iron rod 0.2 m long, 10 mm diameter and of relative permeability 1000 is placed inside a long solenoid wound with 300 turns/m. If a current of 0.5 A is passed through the coil, find the magnetic moment of the rod?

(5 x 4 = 20)

Section D

Answer any 3 (12 marks each)

- 22.1. Obtain expression for wave function and energy Eigen values for electrons confined to three dimensional potential well. Briefly explain the quantum states and degeneracy.

OR

2. Derive an expression for the density of energy states in metals, How does it vary with temperature in metals.
- 23.1. Discuss Debye model of lattice heat capacity. Derive an expression for it.

OR

2. Discuss the thermal conductivity in crystalline material. Briefly discuss Normal and Umklapp process with the help of a diagram
- 24.1. What is meant by spontaneous magnetic moment of a ferromagnet? Obtain an expression for susceptibility in terms of Curie point.

OR

2. Briefly explain the properties of semiconductor nano clusters?

(12 x 3 = 36)