



QP CODE: 25050526



25050526

Reg No :

Name :

MSc DEGREE (CSS) EXAMINATION DECEMBER 2025

First Semester

M Sc PHYSICS (MATERIAL SCIENCE)

Core Courses - PH020103 - CONDENSED MATTER PHYSICS

2019 Admission Onwards

54046C0C

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

Weight 1 each.

1. What are gap modes?
2. Describe phonon - phonon interaction in detail.
3. Define Fermi energy.
4. What is Wiedemann Franz Lorentz law ?
5. Explain the solutions of Kronig penny model.
6. What is meant by polarization mechanism in dielectrics?
7. What are the chief characteristics of ferroelectric materials?
8. What are high T_c superconductors?
9. What is Bohr magneton?
10. What is meant by exchange integral?

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

Weight 2 each.

11. Discuss the momentum and energy conservation laws for neutrons inelastically scattered by phonons.
12. The lattice vibrational frequency of carbon is 4×10^{11} Hz . Calculate the lattice specific heat of carbon atom 30 K.
13. Calculate the energy of an electron in the energy state immediately above the lowest energy level in a cubic box of side 1Å. Also find the temperature at which the average energy of the molecules of a perfect gas would be equal to the energy of the electron in the upper level





14. Describe how tight binding approximation is used to explain electrons in a periodic potential.
15. What are soft and hard superconductors ?Explain.
16. How are cooper pairs are formed? Explain the BCS teory of superconductivity and discuss the energy gap based on this theory.
17. Describe the behavior of magnetic substances with reference to their curie points.
18. Discuss the concept of cooling by adiabatic Demagnetization.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

Weight 5 each.

19. Explain the anharmonicity in crystal and how influences the thermal expansion of crystals.
20. Explain de Hass van Alphen effect and cyclotron resonance.
21. Explain the phenomenon of piezoelectricity. Describe any two applications of the piezoelectric effect.
22. Describe Heisenberg's interaction of the origin of Weiss molecular field. Relate the exchange integral to the Weiss constant and ferromagnetic Curie temperature.

(2×5=10 weightage)

