

QP CODE: 24018803



Reg No :

Name :

MSc DEGREE (CSS) EXAMINATION , APRIL 2024
Second Semester
CORE - PH010204 - CONDENSED MATTER PHYSICS
M Sc PHYSICS, M.Sc. SPACE SCIENCE
2019 Admission Onwards
DFF5E2BC

Time: 3 Hours

Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

Weight 1 each.

1. Define reciprocal lattice. Why is it named so?
2. Define geometric structure factor. What is its significance?
3. What is meant by the Fermi level in metals. How does it vary with temperature in metals?
4. Define Bloch walls in a ferromagnetic crystal. Write an expression for total energy per unit area of a Bloch wall.
5. What do you understand when you see the term “ reduced scheme representation of energy levels”?
6. What do you expect for insulator positive temperature coefficient or negative temperature coefficient? Why?
7. Bring out the drawbacks of Debye model.
8. How does the paramagnetic susceptibility of a substance vary with temperature?
9. What is meant by ferromagnetism?
10. What is meant by ferrimagnetism?

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

Weight 2 each.

11. Starting from Bragg's equation explain how an Ewald sphere can be constructed.
12. Find the least energy of an electron moving in one dimension in an infinitely high potential box of width 0.05 nm.





13. How does quantum free electron theory explain the observed small values of electronic specific heat in metals?
14. Starting from Schrodinger equation, reach central equation for an electron in a periodic potential.
15. What do you understand by Phonon? Express laws of conservation of energy and momentum in case of inelastic scattering of phonons by photon.
16. What is the Debye frequency for Copper, if its Debye temperature is 315 K? Also find the Debye specific heat at 10 K and 300 K.
17. Discuss the domain structure in ferromagnetic materials.
18. Explain the elements of Superfluidity.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. Solve Schrodinger's time independent wave equation for particle in a cubical box of side a , and hence obtain expressions for allowed wave functions and discrete energy values of the particles. How do the expressions vary in a rectangular box?
20. What do you understand by the term intrinsic semiconductor? Get an expression for intrinsic carrier concentration in an intrinsic semiconductor.
21. Describe the phonon dispersion relation in two atom basis.
22. Derive the dispersion relation of antiferromagnetic magnons.

(2×5=10 weightage)

