

(FOR THE CANDIDATES ADMITTED

SUBJECT CODE **23 PPS 206**

DURING THE ACADEMIC YEAR 2023-24 ONLY)

REG.NO.

**N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI**

**END-OF-SEMESTER EXAMINATIONS : MAY – 2024**

**M.Sc. – PHYSICS**

**MAXIMUM MARKS: 75**

**II SEMESTER**

**TIME : 3 HOURS**

## **CONDENSED MATTER PHYSICS**

### **SECTION – A**

**(10 X 1 = 10 MARKS)**

**ANSWER THE FOLLOWING QUESTIONS.**

**(K1)**

1. The Reciprocal lattice is also called as the ----- - space.  
(a)  $h$  (b)  $l$  (c)  $k$  (d)  $t$
2. Debye proposed that waves could be propagated through Solids and their wavelengths ranged from region of Low frequencies pertaining to Sound waves to High frequencies pertaining to -----Absorption.  
(a) UV (b) IR (c) MW (d) Visible
3. The measurements of Hall Voltage gives the information about the-----of Charge carriers.  
(a) sign (b) direction (c) velocity (d) phase
4. Effectively materials with atoms of Unpaired Spins are-----.  
(a) Diamagnetic (b) Ferromagnetic (c) Paramagnetic (d) Ferrimagnetic
5. Josephson predicted that a-----current consisting of correlated pairs of electrons can be made to flow across an insulating gap between two Superconductors provided the gap is small enough.  
(a) Conduction (b) Super (c) Displacement (d) Polarization

**ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES.**

**(K2)**

6. What is Unit Cell?
7. What is known as Born Oppenheimer?
8. Define: Relaxation Time.
9. What are Ferro-electric Crystals?
10. Give the equation for Silsbee's Rule.in Critical currents.

**(CONTD .... 2)**

**SECTION – B****(5 X 5 = 25 MARKS)****ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.****(K3)**

11. (a) Write about (i) SC (ii) BCC (iii) FCC and (iv) HCP crystal systems.  
(OR)  
(b) Explain the Dislocations and Colour Centres in Crystals.
12. (a) Show that the Total Energy of N independent Harmonic oscillators in three dimensions for a gram- molecule of a substance is  $U = 3NKT$ .  
(OR)  
(b) Explain Umklapp Process.
13. (a) Get an expression for a number that connects Thermal and Electrical Conductivities of Metals.  
(OR)  
(b) Discuss the Effective Mass of an Electron.
14. (a) State and explain Piezo, Pyro and Ferrielectric properties of Crystals.  
(OR)  
(b) (i) What are Ferrites?  
(ii) Explain its Structure with an example.
15. (a) State and explain Meissner Effect with diagrams.  
(OR)  
(b) Write a note on elements of BCS theory.

**SECTION – C****(5 X 8 = 40 MARKS)****ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.****(K4/K5)**

16. (a) (i) With an example, explain about Ionic Bonding.  
(ii) Evaluate the Madelung constant of NaCl structure.  
(OR)  
(a) Describe the Powder Crystal method for X-Ray Diffraction with diagrams.
17. (a) Discuss the Dynamics of a Diatomic Linear Chain.  
(OR)  
(b) Obtain an expression for  $C_V$  in Einstein's Model.
18. (a) State and prove the Bloch Theorem.  
(OR)  
(b) Define and explain the construction of Brillouin Zones.
19. (a) Discuss the Langevin's theory of Diamagnetism.  
(OR)  
(b) Explain the Quantum theory of Para-magnetism and analyse the cases.
20. (a) Describe the four different thermodynamics in Superconducting Transitions.  
(OR)  
(b) Obtain London Equations.