STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2004-05 & thereafter)

SUBJECT CODE : **PH/MC/SS64**

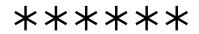**B.Sc. DEGREE EXAMINATION APRIL 2009**
BRANCH III - PHYSICS
SIXTH SEMESTER

REG. No._____

COURSE : **MAJOR – CORE**
PAPER : **SOLID STATE PHYSICS**
TIME : **30 MINS.** MAX. MARKS : 30

SECTION – A

TO BE ANSWERED IN THE QUESTION PAPER ITSELF

ANSWER ALL QUESTIONS: (30 x 1 = 30)

I CHOOSE THE CORRECT ANSWER:

1. The energy required to remove the outer electron from the Na atom is called
   a) Binding Energy   b) Cohesive Energy
   c) Ionisation Energy   d) Dissociation Energy

2. The nature of bonding in CH_4 is
   a) Covalent   b) Ionic   c) Metallic   d) Dispersion

3. The bond that exist in Hydrogen Flouride is
   a) Hydrogen Bonding   b) Vanderwaal's Bonding
   c) Covalent   d) Ionic

4. An extra atom in the interstice of the lattice is
   a) Schottky Defect   b) Frenkel Defect   c) Impurity Atom   d) Interstial atom

5. If the atoms are displaced in two separate planes perpendicular to each other then it is called
   a) Edge Dislocation   b) Burger's Dislocation
   c) Imperfections   d) Stacking Defect

6. The motion of dislocation is possible by
   a) climb   b) slip   c) glide   d) All of these

7. Ohms law relates to the electric field E, conductivity σ and current density J as

   a) $J = \dfrac{E}{\sigma^2}$ b) $J = \sigma E^2$ c) $J = \dfrac{\sigma}{E}$ d) $J = \sigma E$

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8. Which of the following relation gives Wiedmann-Franz law?

    a) $\dfrac{\sigma_T}{\sigma} = LT$ b) $\dfrac{\sigma}{\sigma_T} = LT$ c) $\dfrac{\sigma_T}{\sigma} = \dfrac{L}{\Gamma}$ d) $\dfrac{\sigma}{\sigma T} = \dfrac{T}{L}$

9. If E_H, J_x and B_z are the Hall field, current density and magnetic field strength, then the Hall constant is given by

    a) $R_H = \dfrac{E_H / J_x}{B_z}$ b) $R_H = \dfrac{J_x / E_H}{B_z}$ c) $R_H = \dfrac{B_z}{E_H / J_x}$ d) none of these

10. Which of the following material doesn't have permanent magnetic diodes?
    a) Paramagnetic   b) Diamagnetic
    c) Ferromagnetic   d) Anti-Ferromagnetic

11. Curie-Weiss Law is

    a) $X_m = \dfrac{C}{T}$ b) $X_m = \dfrac{C}{\theta}$ c) $X_m = \dfrac{E}{T - \theta}$ d) $X_m = \dfrac{T - \theta}{C}$

12. The transition temperature of most superconducting elements lie in the range
    a) 0 to 10K   b) 10K to 20K   c) 20K to 50K   d) Above 50K

13. The transition temperature of mercury is
    a) 4.12K   b) 1.14K   c) 2.28K   d) 6.42K

14. The width of the energy gap of a super conductor at 0K is about
    a) 0 joules   b) $3.5 K_B T_C$ c) $300 K_B T_C$ d) KT

15. At elevated bed temperatures, C_V is equal to
    a) Ru   b) 2Ru   c) 3Ru   d) 5Ru

II   FILL IN THE BLANKS:

16. The bond angle between two hydrogen atoms in a water molecule is _____.

17. If the atoms are arranged in a periodic manner, than it is a _____.

18. Magnetic Induction and Magnetic field Intensity are related by the equation _____

19. Susceptibility is maximum at _____ temperature.

20. Superconductivity was discovered by _____.

III   STATE WHETHER TRUE OF FALSE:

21. MgO is an example for Ionic bonding.

22. Schottky Defect is a surface Defect.

23. Ferromagnetic materials or Ferrites are obtained from Aluminium.

24. Zinc is used for making permanent magnets.

25. Superconductivity state is more ordered than the normal state for type I superconductors.

IV   ANSWER IN ONE OR TWO SENTENCES:

26. Give any two characteristics of Ionic bond.

27. What are F-centres?

28. Give any one example for Ferromagnetic element.

29. Give one application of superconductors.

30. What are phonons?

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SECTION – B

ANSWER ANY FIVE QUESTIONS: (5 x 5 = 25)

1.   Explain the directional nature of covalent bond.

2.   Explain Screw – Dislocation.

3.   Obtain the expression for electrical conductivity and thermal conductivity.

4.   Explain the Weiss theory of paramagnatism.

5.   Explain the Meissner effect.

6.   Explain Quantum tunneling.

7.   Explain any two surface defects.

SECTION – C

ANSWER ANY THREE QUESTIONS: (3 x 15 = 45)

8.   a) Define Lattice Energy.
       b) What is Madeling constant.
       c) Explain the potential energy diagram of a Ionic molecule.

9.   Explain Schottky and Frenkel defect.

10.   What is Hall effect? Explain how Hall coefficient can be determined
       experimentally.

11.   Explain any 3 thermodynamic properties of superconductors.

12.   Distinguish Dia, para and Ferromagnetic substances.

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