Fg. 46

YY-2324

**SUBJECT CODE NO: - YY-2324**
FACULTY OF SCIENCE AND TECHNOLOGY
B.Sc. S.Y. (SEM IV) (CBCGS) (Pattern 2022)
Examination April / May - 2024
Physics-XIII Condensed Matter Physics

[Time: 1:30 Hours]   [Max. Marks: 40]

Please check whether you have got the right question paper.

N. B   1. All questions are compulsory.
        2. All questions carry equal marks.
        3. Draw neat diagram and give equations wherever necessary.
        4. Figures to the right indicate full marks.
        5. Use of logarithmic table and calculator is allowed.
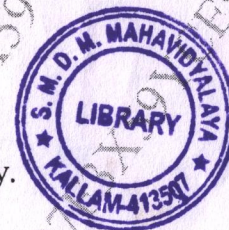
Q.1 A. What is symmetry operations? Explain types of symmetry operation.   10
                                      OR
     B. Describe Debye model of lattice heat capacity of solid and state its limitations.   10

Q.2 A) Describe the formation of ionic bonds and metallic bonds with suitable example.   10
                                      OR
     B) Define Hall Effect. Derive expression for Hall Voltage and Hall Coefficient.   10

Q.3 A) In a crystal, a plane cuts intercepts of 4a, 3b and 6c along the three   05
         crystallographic axes. Determine the miller indices of the plane.
     B) Write short note on Density modes in one-dimensional.   05
                                      OR
     A) Write a short note on Hydrogen bonding.   05
     B) Obtain Wiedemann - Franz relation.   05

Q.4 Multiple Choice Questions. (MCQ)   10

     i)   Which of the following logical relation is correct?
           a) Crystal structure = Crystal lattice × Basis
           b) Crystal lattice = Crystal structure × Basis
           c) Crystal structure = Crystal lattice + Basis
           d) Basis = Crystal lattice + Crystal structure

     ii)   The number of lattice points in a primitive cell is
           a) 1   b) 2   c) 1/2   d) 3/2

iii)   Vander Waals bonds are
  a) Very strong bond   b) Very weak bond
  c) Very very strong bond   d) Does not exists

iv)   Hydrogen bond is formed in
  a) Alcohol   b) Sodium chloride
  c) Chlorine gas   d) Silver nitrate

v)   Metallic bond is similar to
  a) Ionic bond   b) Covalent bond
  c) Hydrogen bond   d) Molecular bond

vi)   The expression for Einstein temperature is
  a) $\theta_E = \dfrac{\hbar}{K_B}$ b) $\theta_E = \dfrac{\hbar\omega_0}{K_B}$ c) $\theta_E = \dfrac{\omega_0}{K_B}$ d) $\theta_E = \dfrac{K_B}{\hbar\omega_0}$

vii) The Debye's continuum model is valid for
  a) Short Wavelength   b) Long Wavelength
  c) High frequency   d) Constant frequency

viii) The band between conduction band (C_B) and valance band (V_B) is called as
  a) C-V band   b) Fermi level
  c) Energy band   d) Forbidden band

ix)   Which of the following is correct relation for Electrical Conductivity (σ) of free electron in metallic wire is
  a) $\sigma = \dfrac{ne^2\lambda_c}{K_B T}$ b) $\sigma = \dfrac{ne\lambda_c}{6K_B T}$
  c) $\sigma = \dfrac{ne^2\lambda_c}{6K_B T}$ d) $\sigma = \dfrac{6K_B T}{ne^2\lambda_c}$

x)   Drude - Lorentz theory is based on the classical ideas of, _____
  a) Maxwell – Boltzmann statistics
  b) Fermic - Dirac statistics
  c) Ohms law
  d) Wiedemann – Franz relation

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