GALGOTIAS UNIVERSITY

ADMISSION NUMBER												

School of Basic Sciences

Master of Science in Physics
Mid Term Examination - May 2024

Duration : 90 Minutes
Max Marks : 50

Sem II - C1PO203T - Solid State Physics

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1) Explain grains and grain boundaries with the help of diagram in crystals. K2 (2)

2) Express the properties of Miller Indices. K1 (3)

3) Write some postulates of Drude theory of metals. K2 (4)

4) Show that the c/a ratio for an ideal hexagonal close-packed (hcp) structure is $\sqrt{(8/3)}$. K2 (6)

5) Distinguish between continuous and characteristic X-ray spectra. K3 (6)

6) K3 (9)

If the potential energy function is expressed as

$$U(r) = -\frac{\alpha}{r^6} + \frac{\beta}{r^{12}}$$

Show that the minimum potential energy is given by, $U_{min} = -\frac{\alpha^2}{4\beta}$.

7) The energy required to remove a pair of ions, Na+ and Cl-, from NaCl is ~2 eV. Calculate the approximate number of Schottky imperfections present in the NaCl crystal at 300K temperature. Consider the volume of one mole of the crystal $26.83\ cm^3$ K4 (8)

8) The potential energy of a diatomic molecule is given by the following relation. K4 (12)

$$U(R) = -\frac{a}{R^2} + \frac{b}{R^{10}}$$

Where, a and b are constants, and R the separation between the molecules. Estimate the separation between molecules for a stable compound.

OR

Define the atomic packing fraction and density of materials. Determine the atomic packing fraction for SC, BCC and FCC unit cell. K4 (12)