



Menufiya University – Faculty of Engineering – General department
Jan 2018 – Final Exam in Solid State Physics – Time : 3 hours

Answer the following questions:

Q1: a) Drive the ratio of thermal & electrical conductivity (Wiedmann-Franz) law?

b) Describe & explain Hall effect & Hall coefficient ?

Q2: a) Starting with the Schrodinger equation for free particle in three dimensions , Find the Fermi energy level ? and the electron velocity v_F at the Fermi surface?

b) Discuss the difference between Debye & Einstein models for the specific heat capacity?

Q3: a) Discuss with details Energy Band structure of the materials ?

b) The Fermi level of silver is 5.5 eV. Calculate the fraction of free electrons at room temperature located up to a width of kT on either side of E_F ?

Q4: a) Explain with details Bravais lattices and the seven crystal systems ?

b) State the unit cell characteristics?

c) Sodium crystallizes in a cubic lattice. The edge of the unit cell is 4.3Å. The density of sodium is 963 kg/m^3 and its atomic weight is 23. How many atoms are contained in one unit cell? What type of cubic unit cell does sodium form?

Q5: a) In the Hexagonal close packed(HCP)cell , Find the volume of the unit cell & atomic packing fraction(APF) & Void space and its density ?

b) Prove that the inter planar distance in a cubic crystal is given by

$$d = \frac{a}{\sqrt{h^2+k^2+l^2}}$$

c) The Bragg angle corresponding to the first order reflection from (111) in crystal is 30° when X-rays of wavelength 1.75Å are used. Calculate the interatomic spacing?

GOOD LUCK

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