

ASSIGNMENT 6

Due: 10 November 2003

Problems:

1. The Hall coefficient of Hg at room temperature is $-7.6 \times 10^{-11} \text{ m}^3 \text{ C}^{-1}$. Estimate the wavelength at which this metal would be expected to lose its high reflectivity.
2. The Hall coefficient of liquid Al is $-3.9 \times 10^{-11} \text{ m}^3 \text{ C}^{-1}$. At 77 K the electron relaxation time is $6.5 \times 10^{-14} \text{ s}$. Estimate the electrical and thermal conductivities of Al at 77 K.
3. Calculate the electron concentrations (electrons per atom) at which a spherical Fermi surface first contacts the first Brillouin zone faces of the bcc and fcc structures.
4. Assume that a linear lattice of atoms is characterized by the following dispersion relation for the conduction electrons: $E = A - B \cos(ka)$ where E , k , and a are the energy, wave vector, and lattice parameter, respectively. A and B are constants. Determine E vs. k and $D(E)$ vs. E for the conduction electrons. Sketch the resulting functions, labeling axes.