Home Problem Set #17 Due : December 15, 2014

1. Calculate C_v at high temperatures (500 K) by using the quantum mechanical equation derived by Einstein. Assume an Einstein temperature of 250 K, and convince yourself that C_v approaches the classical value at high temperatures.

2. Calculate the electronic specific heat for E_F = 5 eV and T = 300 K. How does your result compare with the experimental value of 25 (J/mol K)?

3. Calculate the mean free path of electrons in a metal, such as silver, at room temperature form heat capacity and heat conduction measurements. Take E_F=5eV, K=4.29×10^2 J/s·m·K, and C_v^{el}=1% of the lattice heat capacity. (Hint: Remember that the heat capacity in (21.8) is given per unit volume!)