Homework #4
Due 30 September 2003

1. Derive the expression for the laboratory energy of the recoil nucleus:

$$\frac{E_2}{E_0} = 1 - \frac{E_1}{E_0} = \frac{4 \cdot M_1 \cdot M_2}{\left(M_1 + M_2\right)^2} \cdot \cos\left(\phi\right)^2$$

starting with conservation of energy and momentum for a two particle elastic collision.

2.) Many metals occur with both FCC and BCC structure, and it is observed that the transition from one structure to the other involves only insignicant volume change. Assuming NO VOLUME CHANGE, find the ratio D_{FCC}/D_{BCC} where D_{FCC} and D_{BCC} are the closest distances between metal atoms in the two structures.

3.) Using the following relationship:

$$\frac{d\sigma\left(\theta_c\right)}{d\Omega} = \frac{\left(\frac{Z_1 \cdot Z_2 \cdot e^2}{4 \cdot E_c}\right)^2}{\left(\sin\left(\frac{\theta_c}{2}\right)\right)^4}$$

calculate the differential scattering cross-section per solid angle for 100keV Ar ions incident on Ni for laboratory scattering angles of 10, 15, and 45 degrees.

4. Solve the power law cross section for the hard sphere power law parameter m = 0 and compare with the equation:

$$\frac{d\sigma(E)}{dT} = \frac{\pi \cdot r_{min}^2}{T_M}$$

to find C_0.