Homework 7
Due 28 October 2003

1. **In the case where nuclear stopping predominates, the range can be estimated by ignoring the contributions from electronic stopping to get the equation:**

$$R = \int_{E_0}^{0} \frac{1}{N \cdot S_n(E)} \, dE$$

Derive the range expression in laboratory frame of reference using the energy independent nuclear stopping expression

$$\frac{dE}{dx} = 1.308 \cdot \pi \cdot a_{TF} \cdot N \cdot Z_1 \cdot Z_2 \cdot e^2 \cdot \frac{M_1}{M_1 + M_2}$$

2. **For a 100keV Boron ion in silicon, assume that electronic stopping dominates with $dE/dx = kE^{1/2}$.**

- **Calculate a value for k**
- **Derive an expression for the range**

3. **Calculate the displacement energy for Au in the [111] direction using values for the binding energy ε_b(Au) = 0.47 eV/atom and compressibility of 0.58 m^2/N. Compare your value to the one given in Table 7.1**

Calculate the sublimation energy for Au and compare with values given in Table 7.1 and Figure 7.3

4. **Calculate the damage energy for a 3keV self-ion Si PKA**

Calculate the average number of displacements using equations 7.13 and 7.16