Homework 8
Due 11 November 2003

1. **For 100keV Sn ions in Si, find the approximate value of dpa (using tabulated values for ε and R_p) for a dose of 5×10^{13} ions/cm^2. This level of damage is sufficient to form an amorphus layer in Silicon.**

2. **Using the power law energy-transfer cross-section, calculate the approximate mean free path between Si recoils for both Si and Xe ions with energies of 1, 10, and 100keV. Refer to Section 7.11.1 of the textbook.**

3. **Consider the case of: 1.) Si ions incident on Au, and 2.) Au ions incident on Si; both cases for 100keV incident energies normal to the sample. Which would have the largest value of:**

   a.) **the dimensionless energy ε**
   b.) **electronic energy loss rate, $dE/dx|_e$**
   c.) **nuclear energy loss rate, $dE/dx|_n$**
   d.) **projected range, R_p**
   e.) **sputtering yield, Y (assume a binding energy of U = 5eV)**
   f.) **maximum concentration of implanted species**

4. **Calculate the energy-independent sputtering yield values of Ne, Ar, and Xe incident on Ni at 10keV using the expressions for nuclear stopping given in Chapter 5 and a binding energy of 5 eV.**

   a.) **Compare you values with data given in Chapter 9 (Fig. 9.3)**
   b.) **Calculate values of the dimensionless energy, ε, for the three cases. Are these ε values in a region where nuclear stopping rates would dominate?**
   c.) **For a current of 10μA/cm^2 of Ar, how many monolayers (10^{15} atoms/cm^2) would be removed per second?**