

Physics 330, Spring 2009
HW#11 25 points

1. **(5 points)** In the scattering experiment described in class $\alpha + {}^{11}\text{B} \rightarrow {}^{14}\text{N} + n$, use conservation of energy and momentum to solve for the mass energy of the neutron. Hint: Use the approximation $m_n \ll m_N$ to neglect one of the terms in energy conservation equation. Justify neglecting this term.
2. **(5 points)** Calculate binding energies of ${}^{55}\text{Fe}$, ${}^{57}\text{Co}$ and ${}^{58}\text{Ni}$ and compare to the Weizaecker formula.
3. **(5 points)** What is the approximate nuclear radius for (a) Hydrogen, (b) Iron, (c) Lead.
4. **(5 points)** Consider the Thorium decay series shown in Figure 11-18. For the first three decays, give the half life of the parent, state the type of decay, show the decay reaction (as shown in Eq. 11-40) and calculate the Q value.
5. **(5 points)** Why is the line of stability above the $N = Z$ line on a N versus Z plot? (Figure 11-8)