2021 - PHY 981 - Nuclear Structure Physics - Homework set 1

1. We meet Tuesdays and Thursdays 2-3 pm. link to zoom, If I need to change the zoom link I will send you an email. If you have any problem connecting, send me an email.

   The sessions on Fridays 2-3 will be set up by a student - I will usually be there to discuss and answer questions.

2. Read chapters 1-6.

3. The experimental binding energies are contained in the text file aud16.dat. Make a plot that compares the experimental binding energies for the calcium isotopes to the liquid drop model of Eq. 6.6.

4. Find the proton and neutron drip lines for calcium isotopes from the liquid drop model. How do they compare with experiment?

5. Find the three liquid-model coefficients α_1, α_2 and α_4 and their errors from a fit to the experimental binding energies.

6. Redo the liquid drop fit with the extra term $\alpha_5(N-Z)^4/A^3$.

7. Derive Eq. 5.7.

8. In Fig. 5.4 the lowest point for ^{16}O is at $q = 0.290$ fm^{-1} with a value of $|\mathrm{F}|^2$=0.810. Use this to find the rms charge radius of ^{16}O.

9. Show that the second derivative of the Fermi distribution in Eq. 5.11 is not zero at the origin.