

Reading: Chapters 3, 4

Problems:

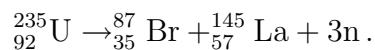
1. Williams, Problem 3.1. Calculate $\langle r^2 \rangle$ for a uniformly charged sphere of radius R . Verify the validity of the formula in 3.1 for the form factor of the sphere obtained in class. [*Hint:* Use again an expansion.]
2. Williams, Problem 3.4.
3. Williams, Problem 4.1.
4. The Coulomb term in the semi-empirical mass formula is

$$a_C Z^2/A^{1/3}.$$

Using the result of Problem 4.1, calculate the value of a_C in MeV. Assume that the nuclear radius is given by $R = 1.12 \times A^{1/3}$ fm.

Using $a_V = 15.85$ MeV, $a_S = 18.34$ MeV, and $a_A = 23.22$ MeV and the fact that the binding energy of ${}_{73}^{181}\text{Ta}$ is 1454 MeV, check your value of a_C . Comment on any discrepancy you may find.

The nucleus ${}_{92}^{235}\text{U}$ can undergo spontaneous fission (see Ch. 5.5) and one of the many fission channels is



Estimate the energy released in this channel. How do the surface and Coulomb energies contribute to the release?

(This is modified Problem 4.2 in Williams.)

Reminder!

I should receive the topic of your term paper, with a brief description the planned content, on Monday, Feb. 3.