

Worksheet April 16

Nuclear physics

What is the atomic number  $Z$  and the atomic mass number  $A$ ?

Give a mathematical expression for the radius of a nucleus.

What is a unified atomic mass unit?

What is the strong nuclear force?

What is binding energy? Give a mathematical expression for it.

Radioactivity

What is radioactivity? What quantity is always conserved in radioactive decay processes?

Describe  $\alpha$  decay.

Describe  $\beta^-$  decay.

Describe  $\beta^+$  decay.

Describe  $\gamma$  decay.

How are  $\alpha$ ,  $\beta^-$ , and  $\gamma$  particles affected by magnetic fields?

PH202-1G  
Spring 2014

Radioactive decay

What is activity? What two units are commonly used for activity?

Give a mathematical expression for activity.

What is half-life? Give a mathematical expression for it.

Describe how radioactive dating can determine the age of an object.

Problems

1. What is the binding energy of the isotope silver-109 (atomic mass 108.904 757 u)?
2. Write the radioactive decay equations for the  $\alpha$  decay of americium-243 and the  $\beta^+$  decay of sodium-22.
3. A sample of krypton-89 initially contains 4 billion radioactive nuclei at time  $t = 0$ . After 9.48 minutes, 500 million radioactive nuclei remain in the sample. a) What is the half-life of krypton? b) What is the activity of krypton after 11.00 minutes?