

HOMEWORK FOR TUESDAY, AUGUST 2, 2005

1. Consider the atom denoted by ${}^{183}_{79}\text{Au}$.

The common name of this element is _____.

It has _____ electrons, _____ protons, _____ neutrons, and _____ quarks.

This atom is radioactive and decays by alpha decay with a half-life of 49 seconds. Determine the fraction of its atoms that decay in each second (i.e., determine its decay constant).

Write down the decay of this atom and determine the new atom that results.

The new atom has _____ protons and _____ neutrons in its nucleus.

2. Consider the atom denoted by ${}^{199}_{79}\text{Au}$.

It has _____ electrons, _____ protons, _____ neutrons, and _____ quarks.

This atom is radioactive and decays by beta decay with a half-life of 3.15 days. Determine the fraction of its atoms that decay in each second (i.e., determine its decay constant).

Write down the decay of this atom and determine the new atom that results.

The new atom has _____ protons and _____ neutrons in its nucleus.

(Continuation of problem 2)

Suppose you had a sample of 1.00×10^{20} atoms of $^{199}_{79}\text{Au}$ at time $t = 0.00$ days. Determine the number of atoms remaining after each of these periods. If the number becomes less than 0.5, just write the number as 0.

2 days:

One week:

One month (30 days):

One year:

10 years:

One century:

How many days will it take for 90% of the initial atoms to decay?

3. The constituents of neutrons and protons are up and down quarks (no others). Each consists of three quarks. Determine the number of up and down quarks for each type of nucleon:

Neutron:

Proton:
