Regents Earth Science
Radio Active Decay Lab

Name: _____

Lab Day:_____Lab Period:_____

Lab Instructor:_____

Background: Some isotopes spontaneously emit particles or energy. This process is called radioactive decay. This happens naturally and is *not* affected by temperature, pressure, or chemical change. Radioactive decay is random, but predictable. This means you cannot predict exactly when any given atom will decay, but you can determine by percentage when billions or trillions of atoms will. This allows scientists to date objects with a high rate of accuracy.

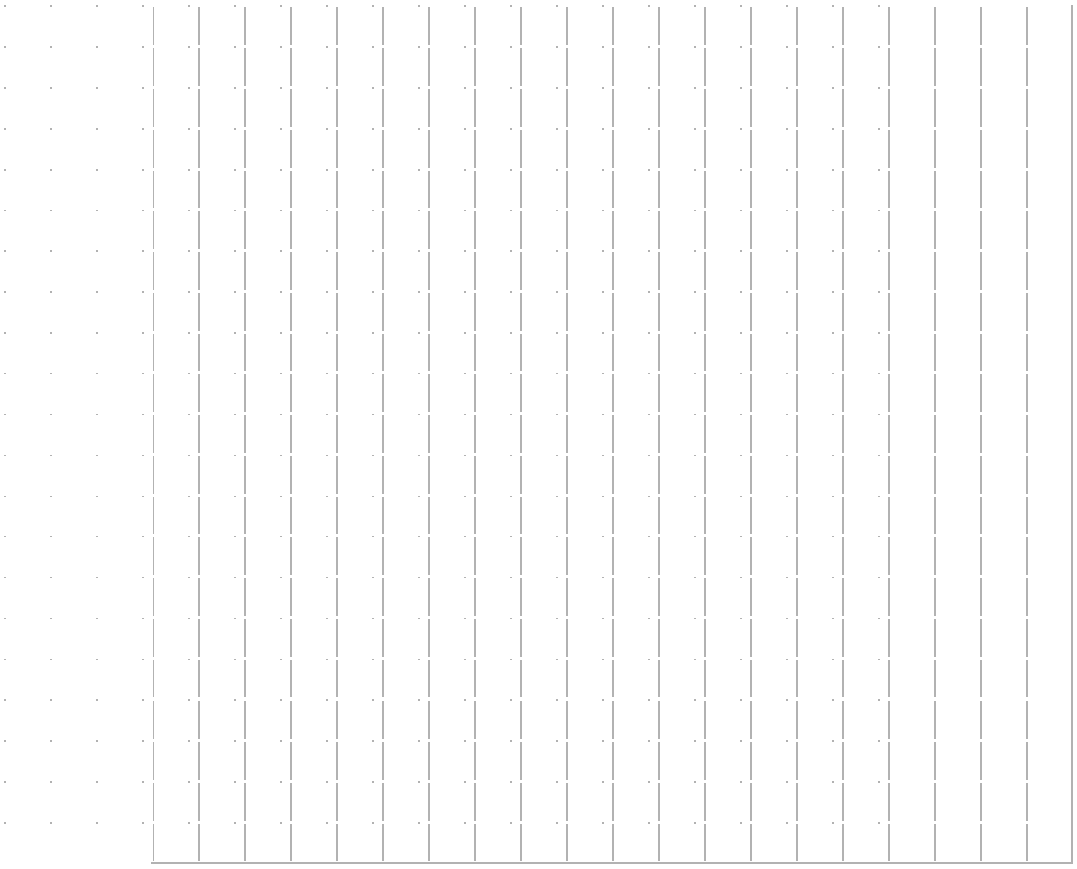
Half lives of common radioisotopes

C^{14}- N^{14} 5700 years
K^{40} – Ar^{40} $1.3x10^{9}$
U^{238} – Pb^{206} $4.5x10^{9}$
Rb^{87} – Sr^{87} $4.9x10^{10}$

Procedure:

1. Open your jar which is a metaphor for a rock, bone, or other material which will be radioactively decaying and count the pennies inside, while at the same time making sure all the head sides are up.
2. The head side represents C^{14} and the tails side represents N^{14}. You will be shaking the jar for 10 seconds which represents the passage of 5700 years or one half life for C^{14}.
3. After each shaking (there will be a total of 6) remove the tails side (N^{14}), Do not put them back in. Once a radioisotope decays to its daughter it cannot return. Count the **total** number of C^{14} and N^{14} and record these numbers in the data table.
4. Graph your results half life vs. C^{14} & N^{14}

Half life	C^{14} – Heads	N^{14} – Tails	% C^{14}	% N^{14}	Overall time elapsed
T0	100	0	100	0	0
T1					5700
T2					11400
T3					
T4					
T5					
T6					



Follow up questions:

1. If you cut your sample in half would that change its half life? Why or why not?

2. If we changed the radio isotope to U^{238} would that change the shape of the graph? Why or why not?

3. Suppose you found a bone of a mastodon which had 6.25% C^{14} and 93.75% N^{14}. How long ago did this animal die? Does this jive with how old mastodons can be?

4. Would C^{14} be a good choice to determine the age of a trilobite? If not give an alternative isotope (from the chart).

5. If we determine that a rock sample (the oldest we could find on planet earth) has about a 50:50 ratio of U^{238} to Pb^{206} how old is this rock? What does that mean about the age of our planet?