Nuclear
Name ___________________________ **Date _________________________**

Understanding Half-Life Makeup

In this activity you will use pennies to simulate the process of radioactive decay. The pennies will help you discover the relationship between the passage of time and the number of radioactive nuclei that decay.

Suppose all the pennies are atoms of an element called coinium. Further, a heads-up penny represents an atom of the radioactive isotope – let's call it headsium – of coinium. The product of the isotope's decay is a tails-up penny – the isotope tailsium.

You will be given 80 pennies and a container. Placing all the pennies heads up in the container will represent the "starting" composition of our radioisotope. Each shake of the container will represent one half-life period. During this period a certain number of headsium nuclei will decay to give you tailsium (that is, some pennies will flip over).

Procedure & Data

Number of Half-Lives	Number of Tailsium (Decayed) "Atoms"	Number of Headsium (Undecayed) "Atoms" INDIVIDUAL	Number of Headsium (Undecayed) "Atoms" CLASS
0	0	**80**	**560**
1	32	**48**	**285**
2	26	**22**	**137**
3	14	**8**	**68**
4	3	**5**	**44**

1. Place 80 pennies heads up in the box.
2. Close the box and shake it vigorously.
3. Open the box. Remove from the box all atoms of *decayed* headsium (coins that have turned over). Record the number of *decayed* headsium and *undecayed* tailsium atoms at the end of this first half-life.
4. Repeat Steps 2 and 3 three more times. At this point you will have simulated four half-lives. You should have five numbers for headsium in your final data table, representing the number of *undecayed* headsium atoms (coins that have not turned over) remaining after zero, one, two, three, and four half-lives.
5. After you are finished with the lab, one person from your group must go up to the blackboard and record the values from your table in the appropriate spots on the board. We will then, together as a class, add the total number of *decayed* atoms for the whole class after the first half-life, the second half-life, and so on. We will do the same for the *undecayed* atoms as well.
6. Finally, on a separate piece of graph paper, you will prepare graphs by plotting the number of half-lives on the x-axis and the number of *undecayed* atoms remaining for each half-life on the y-axis.

YOU WILL MAKE 1 GRAPH with 2 LINES:
ONE FOR YOUR **OWN DATA** AND ONE FOR THE **CLASS-POOLED DATA**.
Attach the graph to your lab notebook!

Post-Lab Questions

1. Look at the two graph lines, are they straight or are they curved lines?
2. Which set of data – your own or the pooled class data – provided the more convincing demonstration of the notion of half-life? Why?
3. Name one similarity and one difference between your simulation and actual radioactive decay?
4. Based on the line graphs you produced, is 'half-life decay' a constant rate of death or does the rate change over time? Why?