Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Pennieum Bag # \_\_\_\_\_\_\_\_

**Half-life: Determining and Graphing the Half-life of Pennieum**

**Background:** You should know the term “half-life” and know how it is related to radioactive elements. The half-life of a radioactive element is the time it takes for half of its atoms to decay into something else. For example, iodine-125 (I-125) has a half-life of about 60 days; therefore, in 60 days, 1g of Iodine-125 will turn into 0.5 g of Iodine-125 and 0.5 g of something else. After another 60 days have elapsed, only a ¼ of the original 1g or 0.25 g of I-125 will remain.

**Purpose:** To determine the half-life of the element Pennieum.

**Materials:**

Bag of Pennieum Isotopes (Radioactive members of this isotope family are easily distinguished via a copper faceon the front surface of the atom), 1 plastic cup, and a pencil/pen

**Procedure:**

1. Count the number of Pennieum atoms as you place them in the cup. They are all initially radioactive. Record the total number of radioactive atoms you start with in your data table.
2. Cover and shake/rattle the cup.
3. Carefully pour your atoms onto your white paper. You will see that some of the sample is still radioactive because you can visibly see the copper face**.**  You may also notice that some of the radioactive atoms in the group have decayed. You will know that they have decayed because the face is not visible or facing up. This means that they are now considered "safe". Since they are no longer radioactive, you can remove them safely. Pull them out of the sample and place to the side.
4. Count the remaining radioactive atoms in the sample. Record in the data table how many atoms are still radioactive.
5. Place the remaining radioactive atoms back in the cup and shake and pour again. Once again remove the safe atoms and record the number of radioactive isotopes still left. You need to continue this pattern until no more radioactive members remain.
6. You must complete two trials before calculating your average

**Pennieum Data Table**

|  |  |  |  |
| --- | --- | --- | --- |
| Shake # | Trial # 1 (# remaining in sample) | Trial # 2 (# remaining in sample) | Average |
| 0 (total in the initial sample) |  |  |  |
|  |  |  |  |
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**Analysis:**

Using the graph paper provided, construct a graph of N (Number of remaining atoms) on the Y axis and the shake number on the X axis. Use the average of the 2 trials to construct this graph.

**Conclusions:**

1. Calculate the half-life of Pennieum? (i.e., What number of shakes are necessary to reduce the

radioactive members to one-half the original sample?)

The shake # should be on the X axis and the remaining number of radioactive isotopes will be the Y axis. Draw in the curve line that results. **Be sure to make your graph use as much of the graph paper as possible.**

