Name____ Date________________________

The Half-life of Candium[1]

Introduction

When discussing radioactive substances, scientists are not only worried about the effects of the radiation on the surrounding environment but how long the substances will remain in their environment. Any radioactive element will emit radiation until it is stable and no longer radioactive. It is important for scientists to know how long it will take a certain sample to decay. For example, Carbon-14 is often used to date or determine the age of materials. Carbon-14 has a half-life of 5,730years, which indicates that a sample of Carbon-14 will remain radioactive for enough time to serve as an effective tool for dating plants or other artifacts that are thousands of years old. So, what exactly happens in a half-life? Let's see if you can figure it out.

In the experiment, you will obtain a sample of radioactive Candium. For safety reasons, it should not be eaten until all radioactive materials have been removed from the room (i.e. until you and your group members have successfully completed the lab). Using this sample, you are going to simulate the half-life of this sample.

Pre-lab Questions

1. Candium has been identified as $^{269}_{110}Cn$. If candium undergoes alpha decay, write the nuclear decay equation for candium.

2. Why is it safe for you to handle candium if it is only going through alpha decay?

Procedure

1. Obtain a sample of radioactive Candium and its "nucleus" container.
2. Count the total number of nuclei present (i.e count the number of pieces of candy that you have). Record the number in your chart.
3. Place the sample of Candium inside its nucleus and seal the nucleus.
4. Shake the sealed nucleus several times. Be careful the sample is decaying.
5. Once you have shaken the nucleus several times, you have completed one half-life. Open your container.
6. Take out the pieces of Candium that have a "M" showing. These samples are no longer radioactive. You should count the number of pieces that you remove and record this in your data table in the row indicating half-life #1 and in the column for non-radioactive pieces.
7. Also, count the number of pieces that are still radioactive, which are the pieces you did not remove.
8. Repeat steps #3-7 at least 5 times. Be sure to record all necessary data in the table below.

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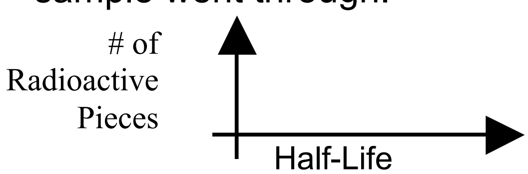
[1] Modified from *M&M Half Life by CRISTAL AND PRI*SMS

Data Table

Half-life	Radioactive Pieces or Pieces Remaining in the Nucleus	Non-radioactive Pieces or Pieces Removed
0	(# of Pieces at the Beginning)	0
1		
2		
3		
4		
5		
6		

Questions

1. On the graph paper on the back of this page, graph the number of pieces that are radioactive (the pieces left in the container) versus the number of half-lives your sample went through.



2. Draw a curve of best fit. In other words, the data points are trying to make a curve. Try to draw a smooth curve that comes as close to as many data points as possible.

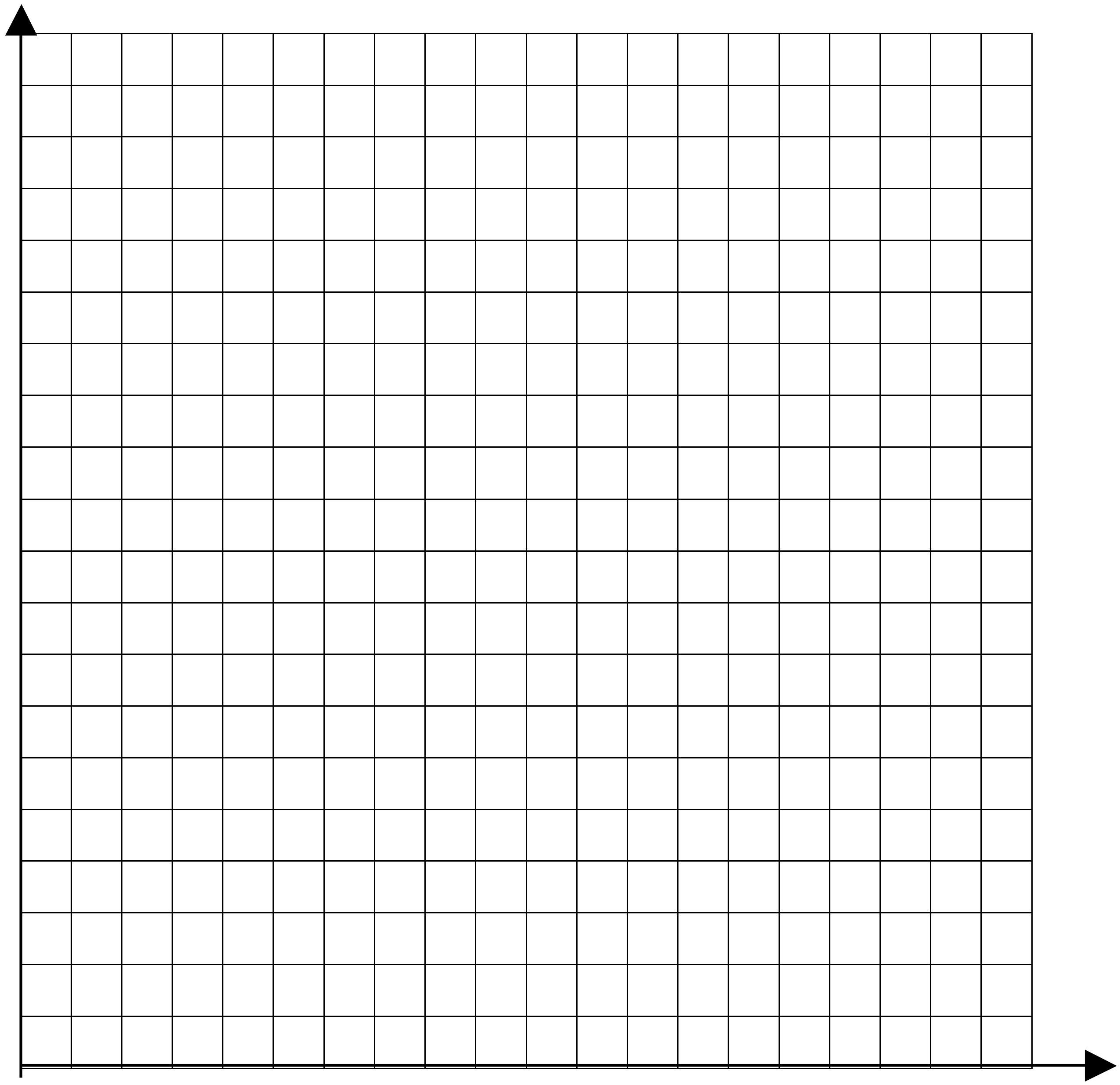
3. Using your graph, how many half-lives did it take to decay roughly 50% of material to decay?

4. Using your graph, how many half-lives did it take to decay roughly 75% of material to decay?

5. Using your graph, how many half-lives did it take to decay roughly 90% of material to decay?

6. If this was carbon-14, how long would it have taken to decay 50% of the original carbon-14? Carbon-14 has a half-life of 5730 years.

7. Based on your data, what do you think happens in one half-life?



Check List for Your Graph

_____Does your graph have a title that does **not** contain the words graph, lab or experiment?

_____Did you label your axes?

_____Did you draw a curve of best fit?