Half-Life of M&Mium Lab Activity

Name:________________________________

Introduction:

Many of the isotopes of nature are stable, meaning that they never change. Other isotopes, both natural and manmade, are radioactive, meaning that they are unstable and can change into another form.

Radioactivity is a process in which a nucleus spontaneously disintegrates or "decays". As you recall from a previous class activity, nuclear reactions can emit alpha particles, beta particles, and/or gamma rays. Each decay of a radioactive parent isotope leaves behind a stable daughter isotope.

One cannot predict when a particular nucleus will decay. If we could watch a group of radioactive atoms, some would decay at once, others later, still others much later. Each isotope has its own "half-life", which is the time it takes for half of any sample to decay. It is impossible to predict when a specific atom is going to decay, but you can predict the number of atoms that will decay in a certain period of time.

Objective:

In this lab activity, we will investigate the decay of M&Mium to better understand the statistical nature of half-life. We will graph the decay of M&Mium and discover the properties of radioactive decay.

Materials:

1. Shoe box
2. M & M's
3. Graph paper
4. Pen or pencil
5. Calculator

Group Roles/Responsibilities:

a. Materials Manager: Obtain materials for group and return materials at end of activity.

b. Data Recorder: Write down all data for the group and make sure that all members of the group get the data at the end of the activity.

c. Box Shaker: Make sure all M&M's are face up in the beginning of the activity. After each successive shake interval, remove the M&M's that are face down.

d. Timer: Count the number of shakes of the box and count the number of M&M's that have been removed after each shake interval. Tell the Data Recorder the number that remain in the box.

Procedures:

1. Write down the number of M&M's that are in your bag (Initial Amount) in the data table below.
2. Place the M&M's in a single-layer in the bottom of the shoebox. Make sure that the "m" is face up. Put the lid back on the box.
3. Shake the box in a regular rhythm 10 times.
4. Take the lid off the box and remove the M&M's that do not have the "m" face up.
5. Count the number of M&M's that you removed from the box. **Write down the number of radioactive M&M's remaining in the box** under 1st Half-life in the data table below.
6. Repeat procedures 2-5 until all the radioactive M&M's have decayed to stable M&M's.
7. When you have completed two trials, calculate the averages in your data.
8. Plot a graph of the number of remaining M&M's versus the time (number of half-lives elapsed). Remember, the dependent variable belongs on the y-axis.

Data:

Trial	Initial Amount	1st Half-life	2nd Half-life	3rd Half-life	4th Half-life	5th Half-life	6th Half-life	7th Half-life	8th H life
1									
2									
Average									

Interpretations and Conclusions:

1. In the case of a true radioactive substance, would the amount of radioactive M&M's really ever disappear? Why or Why not?

2. If you had started off with twice the amount of M&M's, would it have made any difference in the graph you obtained? How does the size of the starting sample affect the half-life curve?

3. How would the hazard associated with the emissions from a radioactive substance change with time?

4. If you started with 2 kg of Thorium-234, how many grams of Th-234 would remain after 168.7 days. How many half-lives would have passed?

5. What is the half-life of M&Mium?