# Radioactive Decay: A Simulation of Half-Life

**Sections required:**

Header
Title
Purpose
Materials
Procedure (cut and paste)
Data (cut and paste)
Graph
Questions

**Procedure:**

1. Double check your m&ms and make sure they all have an "**m**" on one side. Make the completely blank m&ms disappear (humanely, of course).
2. Count the "nuclei" (marked m&ms) and record it into the data table under toss 0.
3. Place your nuclei in a cup, cover and shake the cup. Gently pour the nuclei onto your desk.
4. Separate the nuclei into two piles, "m" side up (still radioactive) and blank side up (has undergone decay). Record the number of "radioactive nuclei" with the "m" side up under **Individual Data**.
5. Return only the radioactive nuclei to your cup.
6. Continue this process by tossing until there are no radioactive nuclei left. Add additional rows to the data table if necessary.
7. Pool the class data by adding the number of radioactive nuclei of all the class groups for each toss.
8. Make sure you properly dispose of the m&ms.

**Data:**

| Toss | Number of Radioactive Nuclei Individual Data | Number of Radioactive Nuclei Class Data |
|---|---|---|
| 0 | | |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

**Graph:**

Using the ***class*** data, prepare a graph by plotting the number of radioactive "nuclei" on the y-axis and the number of tosses, which we will call half-lives, on the x-axis. Make sure you have all your axes labeled and your graph has a title. Draw a smooth curve through your data points.

**Questions:**

1. We assume that half the nuclei decay with each half-life (toss). Is this assumption supported by the data?

2. Why did we graph the class data and not your individual data?

3. Is there any way to predict when a specific piece will land marked side up or "decayed?" If you could follow the fate of an individual atom in a sample of radioactive material, could you predict when it would decay? Explain.

4. What do we mean by half-life? With what kinds of materials do we use this term?

5. If you started with a sample of 600 radioactive nuclei, how many would remain undecayed after three half-lives? Show your work.

6. If 175 undecayed nuclei remained from a sample of 2800 nuclei, how many half-lives have passed? Show your work.

7. Strontium-90 has a half-life of 28.8 years. If you start with a 10-gram sample of strontium-90, how much will be left after 115.2 years? Show your work.