**Half-Life Candy Lab\***

**[yes, you get to eat the candy after the lab is over…you’re welcome]**

**Introduction**

We will be investigating the properties of radioactive substances, or substances that are unstable in nature. In particular we are focusing on its half-life, or how long it takes for half of the original sample of radioactive atoms to decay. Remember, there are three main forms of decay: alpha decay (where helium is released), beta decay (where an electron is released) and gamma decay (where energy is released). We will be using M&M candies, which have an “M” symbol on their candy coat, to investigate half-life. In this lab, pretend that the “M” stands for “Mendelevium,” #101 on the periodic table, and it’s half life is 10 seconds.

**Materials\***

* M&Ms
* Resealable bag

**Procedure**

1. Once the hypothesis and all of the pre-laboratory questions are answered by you and your group members, get your bag of M&M’s
2. Pour out the candy in your bag, and count the number of pieces. Record the data in your data table in the UNDECAYED atoms section in the first row.
3. Seal the bag and gently shake for 10 seconds. After, dump the pieces out on to a paper towel.
4. Lay the pieces flat on the paper. Some pieces will have an “M,” and others will not. Separate them. DO NOT TURN THEM OVER.
5. The section of candy WITH an “M” is UNDECAYED. Record the number in your data table and PLACE THESE CANDIES BACK INTO YOUR BAG
6. The Section of candy WITHOUT an “M” is DECAYED. Record the number in your data table and EAT THESE CANDIES.
7. Gently shake the sealed bag again for 10 seconds, pour it out and repeat the process.
8. Continue shaking, counting, and consuming until all the atoms have decayed.
9. Graph the number of undecayed atoms vs. time.

**Hypothesis\***

How long do you think it will take for all the pieces to “decay” (in seconds)? Do you think this will be a fast process or a slow process? Why do you think so?

**Pre-Laboratory Questions [look in the introduction]\***

1. How do you know you have a radioactive substance?
2. What is a radioactive substance’s half-life?
3. What are the three major forms of decay?
4. In each of the three major forms of decay you listed in #3, what is being released in each of them?
5. Remember, the M on the M&M’s stands for Mendelevium. Say you have a sample of Mendelevium-275. Show the reaction if this sample undergoes:
   1. Alpha Decay
   2. Beta Decay
   3. Gamma Decay

**\**the starred items represent the sections that you MUST put in your lab report***

**Data and Observations [copy data table into your lab sheet] \***

**Candy Half-Life - Data Sheet**

|  |  |  |  |
| --- | --- | --- | --- |
| **Half-Life** | **Total Time** | **# of Undecayed Atoms** | **# of Decayed Atoms** |
| **0** | 0 |  | 0 |
| **1** |  |  |  |
| **2** |  |  |  |
| **3** |  |  |  |
| **4** |  |  |  |
| **5** |  |  |  |
| **6** |  |  |  |
| **7** |  |  |  |
| **8** |  |  |  |
| **9** |  |  |  |
| **10** |  |  |  |

**Graph\***

**Using the data above, make a graph with TIME on the x-axis and #ATOMS on the y-axis.**

M&M’s Graph

# Undecayed Atoms

**Post-Laboratory Questions\***

Time (seconds)

* 1. What is the half life of M&M’s [how long did it take for half of your sample to decay]?
  2. Looking at your graph, what happens to the line as time goes by (does it increase or decrease)? What does this mean in terms of the number of decayed atoms, and how quickly the decaying process happens?
  3. When cutting something in half a lot of times, is it possible to ever get zero? With this in mind, should your half-life line ever touch zero in the graph you have made?

**Conclusion\***

What have you leaned in this experiment? Was your hypothesis correct? Did you encounter any problems in this lab?