

# ATOMIC M&M's UNDERSTANDING HALF LIFE

## Introduction

In this laboratory you will use m&m candies to demonstrate and graph the radioactive decay of a radioactive isotope.

In any sample of a radioactive isotope, the individual atoms are decaying in a random fashion. It is impossible to predict which atom is the next to decay, yet statistically you can predict how many atoms will decay in a certain period of time. Scientists measure how much time elapses while half the atoms in a given radioactive sample decay. That time is called the half-life.

Half lives of radioactive isotopes vary greatly, from much less than a second to billions of years. The half life is an important consideration when choosing a radioactive isotope for a specific application such as radioactive dating of fossils or use as a medical tracer.

## Materials

- (a) 100 m&m candies
- (b) paper cup
- (c) napkin or paper towel

## Procedure

1. Place 100 m&m candies into a paper cup.
2. Place your hand over the opening of the cup and shake the m&m's for five seconds.
3. Carefully pour the candies onto a paper towel or napkin.
4. Count and remove from your sample all of the m&m's in which the letters are face down. These are the "atoms" in your sample which have radioactively decayed. Record the number of atoms which have decayed in Data Table 1.
5. Return all of the candies which have the letters up (atoms which have not decayed) to the paper cup.
6. Place your hand over the cup and shake the remaining candies for five seconds. Pour the candies out onto the paper towel and count and remove all the candies with the letters facing down. Record the number in Data Table 1.
7. Continue this process until either one or no candies remain.
8. You may now eat your m&m's!

## Data

Shake Number	Number of m&m's Removed
1	
2	
3	
4	
5	
6	
7	
8	

Data Table 1

a) Use your experimental data in Data Table 1 to complete the table below.

Time Passed (sec)	Number of m&m's remaining
0	
5	
10	
15	
20	
25	
30	
35	
40	

Data Table 2

b) Make a graph of your experimental results using the information in Data Table 2. Plot "Time (sec)" on the x-axis and "Number of Atoms Remaining" on the y-axis.

## Questions

1. Explain what is meant by the term half-life. What is the half-life of your "atomic m&m's"?
2. How would you describe the shape of your graph? Suppose you had started with 1000 m&m's. Would the shape of your graph be different? Explain your answer.
3. Is it possible to predict how many m&m's will be heads down for each slake? Explain your answer.
4. Is it possible to identify in advance which m&m's will be heads down?
5. The half-life of Iodine-125 is 60 days. The half-life of Iodine-131 is 8.05 days. Often radioactive isotopes are used as tracers in diagnostic medical tests. Radioactive iodine is used to help diagnose diseases of the thyroid gland. Which of these two isotopes would be best to use in this application? Explain your answer.
6. One of the controversies surrounding the use of nuclear power is the storage of nuclear waste generated by the power plants. Explain how the concept of half-life is an important consideration in this debate.