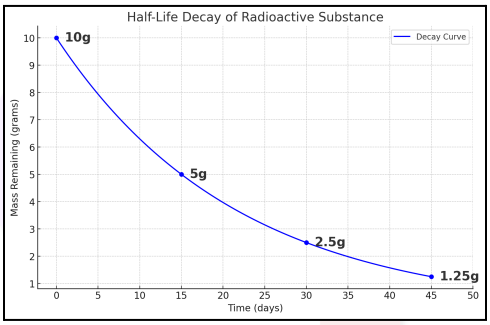
Twizzler Decay

Modeling Radioactive Decay & Half-Life

NAME: **DATE:** **BLOCK:**

INTRODUCTION: Radioactive decay is a natural process where certain unstable atoms release energy to become more stable. These atoms, known as radioisotopes, give off particles or energy as they break down. This breakdown rate is specific to each radioactive element; some elements decay quickly, while others take thousands or even millions of years to change.

To understand this process, we use the concept of half-life. A half-life is the time it takes for half of the atoms in a radioactive sample to decay. Imagine it as a countdown—every half-life period, half of the remaining radioactive atoms "disappear." In the example graph, you can see how a 10-gram sample of a radioactive substance decays over 50 days. The substance loses half of its mass, from 10 grams to 5 grams, in 15 days. So, the half-life for this substance is 15 days.



In this lab, we'll model half-life using Twizzlers as our "radioactive atoms." With each "cut," you'll simulate the decay process, observing how the sample decreases step by step. By the end, you'll see how half-life works and understand the predictability of radioactive decay over time.

PRE-LAB QUESTIONS:

1. What are radioisotopes, and why do they go through the process of radioactive decay?

2. Explain what "half-life" means in your own words.

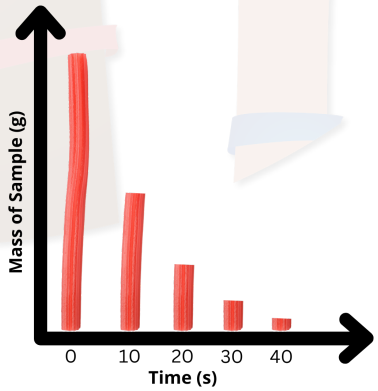
3. Using the example graph:
   a. How many grams of the radioactive substance remain after 45 days?

   b. How many half-lives have occurred after 45 days?

MATERIALS RECEIPT:

Twizzlers (2/student)	$5.00 (32 oz)
Plastic Knives (1/student)	$3.50 (48 ct)
Paper Towel	- - -
Digital Scale	- - -
Timer (Phone)	- - -
Graphing Sheet	- - -
TOTAL	**$8.50**

EXPERIMENTAL SET-UP:



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PROCEDURE:

1. Weigh one Twizzler. Place a paper towel on the scale, zero it out, and record the Twizzler's mass in the data table under "0 half-lives."
2. Graph the whole Twizzler. Place it on graph paper at 0 seconds, marking its highest point and labeling the mass. Leave it there.
3. Start the timer, pause at 10 seconds, and cut a second Twizzler in half. Record the mass of one half for "1 half-life." Place that half on the graph at 10 seconds, mark its highest point, label the mass, and leave it there. Set aside the other half for the next cut.
4. Repeat every 10 seconds. Continue cutting, recording each mass for 2, 3, and 4 half-lives, placing each half on the graph paper, marking and labeling its highest point, and saving the remaining piece for the next cut.
5. Finish and connect points. After plotting, connect the points with a curve and enjoy your Twizzlers!

DATA/OBSERVATIONS:

Half-Life	0	1	2	3	4
Time (s)	0	10	20	30	40
Mass (g)					

POST-LAB QUESTIONS:

1. What is the half-life of your Twizzler? Explain how you determined this value.

2. If you continued to a 5th half-life, how many grams of your Twizzler would remain? Show your calculations.

3. If you began with a Twizzler twice the mass of the one used in the lab, how much would remain after 20 seconds? Show your calculations.

4. Based on your graph, how would the curve change if the Twizzler had a half-life of 5 seconds instead of 10 seconds? Describe the shape of this new decay curve.

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