Red Licorice Decay

Student Activity

Introduction

Use red licorice to demonstrate radioactive decay and half-life. How many half lives are possible until it is too difficult to detect the red licorice?

Concepts

- Radioactivity
- Radioactive decay
- Half-life

Materials

Red licorice "twizzlers"
Plastic knife
Paper towel
Graph paper
Ruler with millimeter scale

Safety Precautions

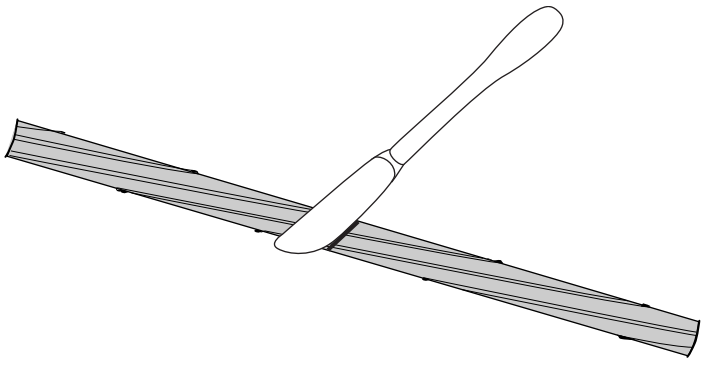
Follow all normal laboratory safety guidelines.

Procedure

1. Place one piece of red licorice on a clean paper towel.
2. Measure the length of the red licorice to the nearest millimeter. Record the length.
3. Calculate the mid-point of the red licorice.
4. Cut the red licorice in half using the knife.
5. Dispose of one-half of the red licorice as instructed by your teacher.
6. Repeat steps 2–5 until the red licorice can no longer be cut in half.

Results and Analysis

1. Draw a bar graph of the "radioactive decay" of red licorice with the y-axis being the length in millimeters and each bar representing a half-life.
2. Calculate the percent of the original sample of red licorice that remained after each half-life.
3. How many half-lives occur until you could no longer cut the licorice in half? What percent of the licorice was left at this point.
4. As the licorice decayed, did the mass of the licorice disappear?



5. How many half-lives are required until less than 0.1% of the original sample remains?
6. If a material has a half-life of 10 minutes, how long until less than 0.1% of the original sample remains?

Publication No. 10555
061616

Teacher Notes

Red Licorice Decay

Background

Introduce the important concepts of radioactive decay and half-life with this easy and fun activity. This activity can also be used to discuss radioactive pollution. Although an isotope will never completely decay and will always be capable of releasing radiation, it does reach a point at which so little radiation is released that it is no longer considered hazardous. Radioactive materials with short half-lives are used as medical diagnostic materials for this very reason.

One misconception students have is that when a material decays, the mass of the material disappears. Stress to students that when radioactive material decays, the mass still stays the same but the atoms decompose to produce different atoms.

Safety Precautions

This activity should be performed in a classroom or cafeteria and not a laboratory setting. Food-grade items that have been brought into the lab are considered laboratory chemicals and are for lab use only. Do not taste or ingest any materials in the chemistry laboratory. Do not remove any remaining food items from the lab after they have been used in the lab. If a non-laboratory setting cannot be used, this activity may be performed using a straw or similar non-food items.

NGSS Alignment

This laboratory activity relates to the following Next Generation Science Standards (2013):

Disciplinary Core Ideas: Middle School
- MS-PS1 Matter and Its Interactions
  - PS1.A: Structure and Properties of Matter
  - PS1.B: Chemical Reactions

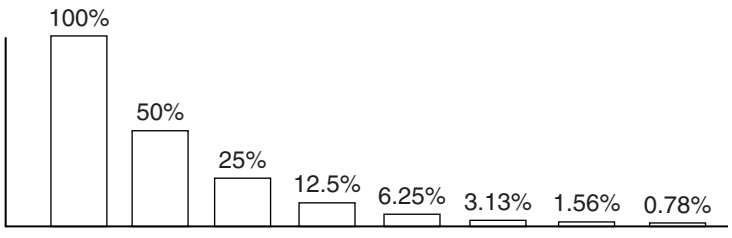
Disciplinary Core Ideas: High School
- HS-PS1 Matter and Its Interactions
  - PS1.A: Structure and Properties of Matter
  - PS1.B: Chemical Reactions
- HS-PS3 Energy
  - PS3.A: Definitions of Energy
  - PS3.B: Conservation of Energy and Energy Transfer
  - PS3.C: Relationship between Energy and Forces

Science and Engineering Practices
- Developing and using models
- Constructing explanations and designing solutions

Crosscutting Concepts
- Patterns
- Scale, proportion, and quantity
- Systems and system models
- Energy and matter

Sample Results and Analysis

1.
2.



3. *Usually six to seven half-lives.*
4. *No.*
5. *10 half-lives.*
6. *100 minutes.*

Acknowledgment

Special thanks to Doug De La Matter, Barry's Bay, Ontario for sharing this activity with Flinn Scientific.