The Half-Life of Candy

Estimated Time: 30 minutes

SUMMARY
Candy is always awesome, but what if it could be used to teach students about the half-life of radioactive elements? In the activity, you can use Skittles or M&M's (or for a non-food option, choose pennies) to simulate radioactive decay. Scientists use the rate of decay to determine how old organic materials are. This method can determine the age within a few hundred years of accuracy!

WHAT YOU'LL LEARN
- Rate of radioactive decay
- Graphing results to create a predictive curve

Materials Used
● 10 candies with one side imprinted (i.e. Skittles or M&M's) or 10 coins with two different sides (i.e. pennies or dimes) ● Plastic bag or cup ● Graph paper ● Ruler ● Pencil
Resources Used
● https://courses.lumenlearning.com/boundless-chemistry/chapter/carbon/

WHAT TO DO
1. Place 10 candies or pennies into a bag or cup.
2. Carefully shake the bag then empty the contents onto a clean, flat surface.
3. Pick up only the candies with the imprint showing (such as the "M" for M&Ms). For coins, only pick up the coins that are head's up. These atoms are still radioactive. The remaining candies or coins have decayed and are now stable; these atoms can be discarded.
4. Have the student count the number of radioactive materials and note this value for "trial 1". Return the radioactive atoms to the cup or bag.
5. Have the student repeat steps 2-4 until all material is stable, or 10 trials have occurred. Encourage the student to record specific and detailed data.
6. Using the data, create a graph with the vertical axis (y-axis) as the number of candies and the horizontal axis (x-axis) as the trial number. What can be said about the graph? At what trial numbers did about 50%, 25%, and 10% of the radioactive material remain?

TIPS
- Isotopes have the same chemical properties and same atomic number but different masses. Isotopes are different in their nuclear properties of the atom. For example, carbon has three main isotopes (carbon 12, carbon 13, and carbon 14) and all have the atomic number 6 (6 protons in the nucleus); however, they have different numbers of neutrons in the nucleus. Carbon 12 and 13 are stable—they do not decay over time—but

carbon 14 is radioactive. Radioactive materials contain some nuclei that are stable and some that are unstable. They decay at a unique fixed rate called the half-life. The half-life of a radioactive isotope is the amount of time that passes before half of a quantity of isotope is stable. For instance, carbon 14 has a half-life of 5,730 years. This means in one gram of carbon 14, half of it will be stable in 5,730 years. This science is used in radiometric dating, which uses the natural abundance of radioactive atoms to their remaining decay products.

- Isotopes are slightly different from allotropes, which have different chemical and physical properties. Carbon has many allotropes, such as diamond and graphite. One of our favorite allotropes of carbon is the fullerene or buckyball - Carbon 64. If you look at our STEM Center logo, it is a “flattened” version of a fullerene!
- Try this experiment again with more material and compare your graphs!