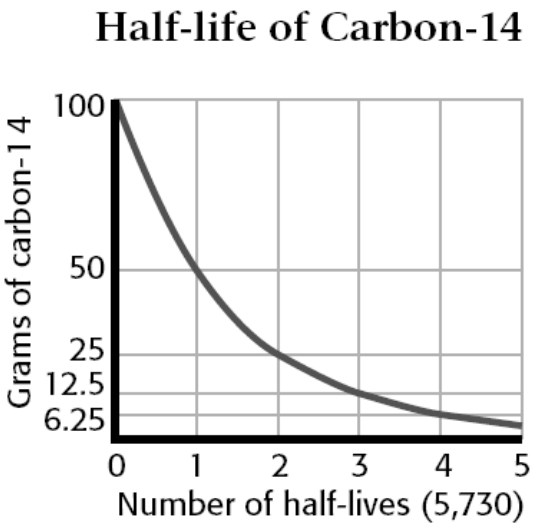
Carbon Dating Lab

Can you use M&Ms to demonstrate half-lives?



Materials per pair: 2tbsp mini M&Ms (about 100), bag, paper plate(Teacher note: a 2.8 oz bag has about 1000)

Background information:

Absolute/radiometric dating is a way to measure the age of fossils and rocks using half-life. In radioactive isotopes the nuclei in the atoms are unstable and they decay, or break apart. They always decay at a constant rate. A half-life is the amount of time necessary for one half the nuclei in a sample to decay to its stable (non-radioactive) isotope.

To date relatively recent events and organisms (up to 75,000 years ago) Carbon is used. When an organism is alive, the amount of Carbon-14 (the radioactive isotope) and Carbon-12 (the stable isotope) are the same. When dating a fossil, scientists compare the amount of Carbon-14 (which started decaying when the organism died) to Carbon-12, the stable form of Carbon. The half-life of Carbon-14 is 5,730 years! To date much older rocks, Uranium-238, Uranium-235, and Potassium-40 are commonly used; their half-lives are measured in millions or billions of years.

Prelab Question: YOU MUST ANSWER THESE BEFORE BEGINNING!

1. Define half-life_____
2. What is half-life used for_____
3. What is the half-life of carbon 14? _____
4. What 3 radioactive isotopes are used to date really old rocks? _____ &_____ & _____
5. Look at the graph above. If I start with 100 grams of Carbon-14, how many half-lives will it take to have 50?_____
6. If I have something with a half-life of 1000 years, how many years will it take to have 50% of the original amount?_____

AFTER YOU HAVE COMPLETED THE PRELAB QUESTIONS,

Instructions:

7. Count the candies. If you have more than 100, eat the extra. If you are a few short, tell the teacher how many you need. Then place all 100 candies in the bag. Shake the bag gently several times.

8. Dump the candies onto the plate and take out all of the candies that have the “m” side up. Record the number of candies removed and the number remaining in the data table one the back. After you record the number removed, you may eat them or put them off to the side on a clean paper towel for later. Put the “m” side down candies back into the bag.

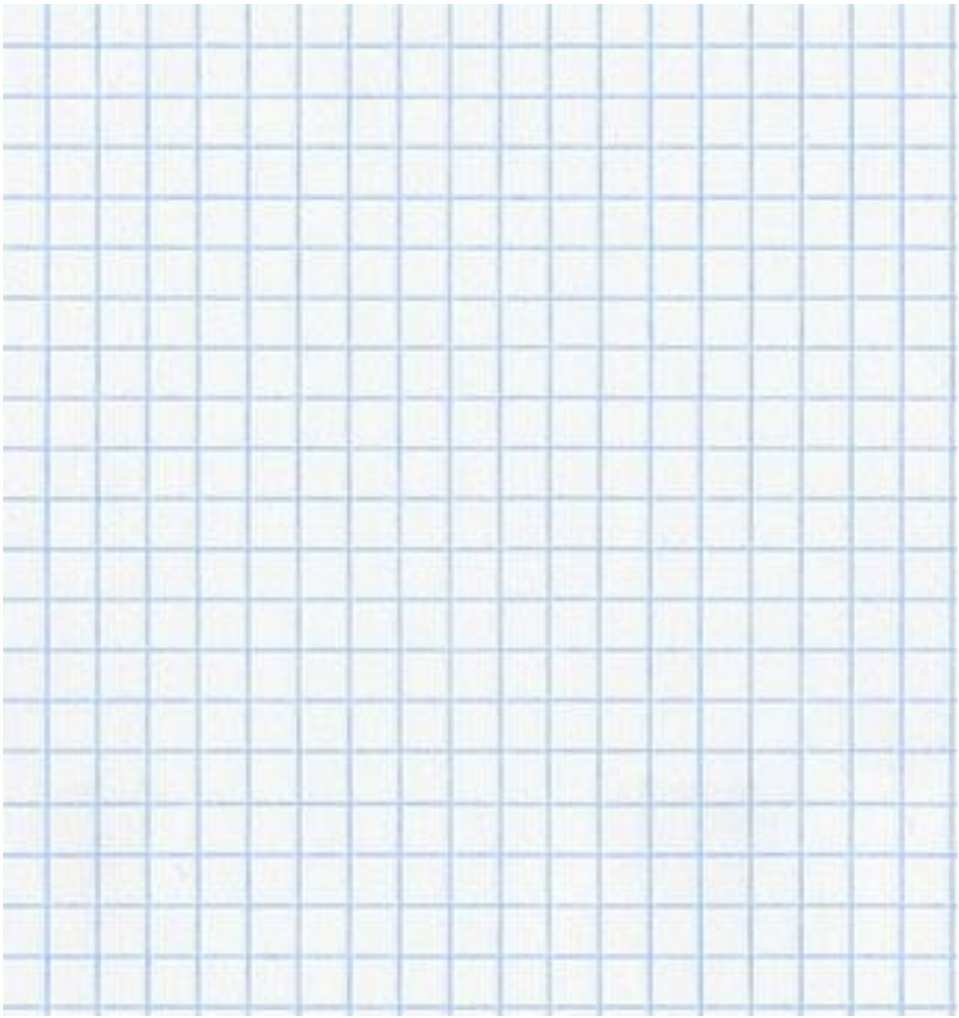
9. Repeat shake trials (step 8) until you are out of candies and record your data in the table. Save the plates for reuse and give the paper bag to the teacher for reuse/recycle unless you need it to take candy with you.

Shake Number	Number of candies remaining	Number of candies removed
1		
2		

10. What is the probability of an M&M landing m side up?_____

11. Half life is represented by which of these:_____ (Think carefully about which reduced it by half each time it happened)
A. shake number
B. number of candies remaining
C. number of candies removed

12. Graph your data. The y (side) axis is number of candies remaining and the x (bottom) axis is shake number (half lives). Connect the dots to draw a best-fit line. Label the axis and make sure it has a title.



13. Compare your graph to the Carbon-14 graph. Is the best-fit line similar? _____

14. How many half lives would it take to have 25% of the candies if each shake is a half-life? _____

DO NOT SKIP THE GRAPH! IT IS WORTH 50% of grade.