Radiometric Dating Lab…..it is all about half-lives.

Absolute time is figuring the age of rocks and/or fossils. Radiometric Dating is the process of determining absolute time. Scientists know that isotopes decay at a known rate, therefore can be used as “clocks” determining the absolute age of rocks and fossils. Radioactive isotopes otherwise known as “Parent Isotopes” spontaneously decay by emitting protons and neutrons into stable isotopes otherwise known as “daughter isotopes.” For example C-14 decays into N-14. The time it takes one half of the parent Isotopes to decay into daughter atoms, is called Half Life. In this lab students will model radiometric dating techniques.

**Pennies = atoms that are either radioactive istopes or stable isotopes.**

**Heads: Radioactive isotope (Parent isotope) Tails: Stable isotope (Daughter isotope)**

**Materials:** 100 pennies and a cup.

**Procedure: 1.** Count to make sure you have 100 pennies in your bag and then place them in the cup. To start you have 100 atoms that are radioactive.

1. Roll your atoms onto the table and remove all of the atoms that have decayed to a stable atoms and put them aside.
2. Count and record the number of radioactive atoms remaining. Record the data in your data table. Return all radioactive atoms to the cup.
3. Once again roll the radioactive atoms onto the table and remove all the atoms that have decayed to a stable isotope and put them aside.
4. Once again count and record the number of radioactive atoms remaining. Record the data in your data table. Return all radioactive atoms to the cup.
5. Repeat steps 4 and 5 until all radioactive atoms have decayed.
6. Complete 1-6 twice so you have two sets of data.
7. For each trial calculate the percentage of radioactive atoms remaining after each trail. Record the data in the table.

 *Radioactive isotopes / original number X 100% = Percentage of original isotopes*

**Data Table:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Trials | Radioactive atoms First Set of Data | Percentage of Original | Radioactive atoms Second Set of Data | Percentage of Original |
| Start | 100 |  | 100 |  |
| 1 |  |  |  |  |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| 4 |  |  |  |  |
| 5 |  |  |  |  |
| 6 |  |  |  |  |
| 7 |  |  |  |  |
| 8 |  |  |  |  |
| 9 |  |  |  |  |
| 10 |  |  |  |  |

**Analysis:**

Graph 1 set of results. Number of trials should be on the X –axis and number of Radioactive atoms on the Y-axis. Make sure to start with 100 on the top of the Y-axis.

**Conclusion Questions:**

1. Using this model what represented the time it took for one half life.
2. If 50% of the parent-isotope remains, how many half-lives has the sample gone through?
3. Assume you begin with 10.0 grams of a radioactive isotope. How many grams of the original Isotope will be present in the sample after each of the following half-lives?

1 half-life; 2 half-lives; and 4 half-lives.

1. C-14 has a half-life of 5730 years. Explain what this means.

**Read the article “Radiocarbon Dating helps Archaeologists understand first Montanans.”**

1. Radiocarbon dating can be used to date materials that lived during the past 50,000 years. What types of materials found at bison kill sites could be dated using the Carbon-14 technique?
2. Bison bones at the base of a cliff in south central Montana are found with arrows made by Shoshone Indians. The bones contain 25% of their original Carbon 14. According to your graph, how long ago were the Shoshone using this kill site?
3. How does radiometric dating help understand the history of First Peoples in Montana?

**Earth Science Textbook**

1. Read pages 350-351 in Earth Science Text. Why can’t radiocarbon dating be used to figure out how old igneous rock is?
2. Study figure 12 on page 345. In your own words, explain how they determined that “rock unit A” was deposited in “Time 4.”
3. Read page 343 in Earth Science Text. List the four kinds of trace fossils described.