

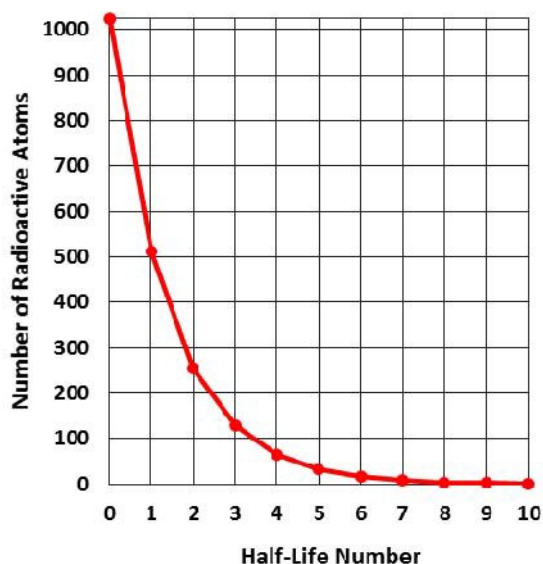
Half-Life Data-Teacher Answer Key

1. Hypothesize what half-life is:

Half-life is the amount of time it takes for approximately half of the radioactive atoms in a sample to decay into a more stable form. Every radioactive element has a different half-life.

2. Calculate the number of radioactive atoms remaining after each half-life. Write the number of atoms in the "Number of Radioactive Atoms" column. Plot the number of radioactive atoms on the graph provided. Note that the number of unstable (radioactive) atoms decreases as they are being transformed into stable atoms.

Half-Life Number	Number of Radioactive Atoms
0	1024
1	512
2	256
3	128
4	64
5	32
6	16



Observations: Answers will vary, but students should recognize that the number of radioactive atoms decreases by half after each half-life.

Questions:

3. If you had a sample of 4,000 radioactive atoms, how many atoms would remain after 5 half-lives?
125 radioactive atoms.

Half-Life Number	Number of Radioactive Atoms
0	4000
1	2000
2	1000
3	500
4	250
5	125

4. If you had a sample of 210 atoms, and you started with a sample of 3,360 atoms, how many half-lives have elapsed? **4 half-lives.**

Half-Life Number	Number of Radioactive Atoms
0	3360
1	1680
2	840
3	420
4	210

5. If the half-life of the sample from question 2 is 30 minutes, how many hours did it take to decay from 3,360 atoms to 210 atoms? **2 hours.**

Half-Life Number	Number of Radioactive Atoms	Time that has passed (minutes)
0	3360	0
1	1680	30
2	840	60
3	420	90
4	210	120

6. Can you determine the age of something (like a fossil) by examining its half-life? Explain. **Yes, this process is called carbon dating. Basically, all living things are made of carbon that continuously cycles through the environment. A small portion of this carbon is in the form of carbon-14, an unstable (radioactive) element. Once an organism dies, the carbon-14 begins to disintegrate. Because it disintegrates at a steady known rate, scientists can measure the amount of carbon-14 remaining and use a scientific formula to determine the age of the sample.**
7. In what other ways might it be useful to know a sample's half-life? **It helps in determining how long radioactive material must be safely stored, when radioactive material will be safe to handle, or how long a source will remain radioactive. For example, radioactive dye (called a tracer) and radioactive seeds are used in medical imaging and cancer treatment. Knowing the half-life helps doctors and patients know how long the radioactive material will be effective and when it will stop producing radiation.**