

There are many different forms of radioactive waste. Here are a few examples.

- Used nuclear fuel
- Discarded parts from nuclear reactors
- Filters used to separate radioactive materials from water
- Protective clothing of workers in contaminated areas
- Medical supplies used in connection with radioactive materials
- Remains of lab animals injected with radioactive materials for research



In the United States, there are three low-level radioactive waste disposal facilities. They are located in Barnwell, South Carolina; Clive, Utah; and Richland, Washington.

EXAMPLE 6 Finding an Exponential Decay Rate

Ten grams of plutonium-239 are placed into a hazardous materials waste dump. Use the spreadsheet to determine how long it will take the 10 grams of plutonium-239 to decay to about 1 gram.

	A	B
1	Years	Grams Remaining
2	0	10.0
3	10,000	7.5
4	20,000	5.6
5	30,000	4.2

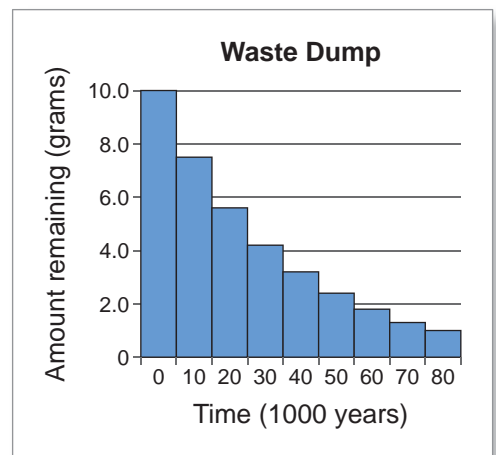
SOLUTION

The rate of exponential decay is given by

$$\frac{A_1}{A_0} = \frac{7.5}{10} = 0.75 = 1 - r.$$

This implies that $r = 0.25$ and the rate of decay is 25% every 10,000 years. Use a spreadsheet to calculate the amount remaining.

DATA	A	B
1	Years	Grams Remaining
2	0	10.0
3	10,000	7.5
4	20,000	5.6
5	30,000	4.2
6	40,000	3.2
7	50,000	2.4
8	60,000	1.8
9	70,000	1.3
10	80,000	1.0



It will take about 80,000 years for the 10 grams of plutonium-239 to decay to about 1 gram.

✓ Checkpoint

Help at Math.andYOU.com

How much longer will it take the plutonium-239 to decay to about one-tenth of a gram? Explain your reasoning.