**Example 1**

Carbon-14 has a ½ life of 5,730 years. If a fossil has 1/8 of its original carbon-14, how old is it?

X 🡪 1/2 🡪 1/4 🡪 1/8

\*\*Half-life is represented by arrows

Therefore, each half-life took 5,730 years and there were three half-lives. So,

5,730

x 3

**17,190 years old**

**Example 2**

Barium-139 has a ½ life of 86 minutes. Suppose you had 50 grams of Barium-139. After 344 minutes, how much Barium will be left?

If a half-life is 86 minutes, how many half-lives will take place in 344 minutes?

344 = 4 half-lives

86

50 🡪 25 🡪 12.5 🡪 6.25 🡪 3.125

Therefore, **3.125 grams** will be left after 344 minutes.

1. If the half-life of iodine-131 is 8.10 days, how long will it take a 50.00 g sample to decay to 6.25 g?

2. Chromium-48 has a short half-life of 21.6 hours. In theory, how long will it take 360.00 g of chromium-48 to decay to 11.25 g?

3. Potassium-42 has a half-life of 12.4 hours. How much of an 848 g sample of potassium-42 will be left after 62.0 hours?

4. Carbon-14 has a half-life of 5730 years. How much of a 144 g sample of carbon-14 will remain after 1.719 x 104 years?

5. Suppose you find a shark tooth on the beach and estimate it is 15,000 years old. Would you use 238U or 14C to confirm the date of the tooth? Explain.

6. The half-life of Zn-71 is 2.4 minutes. If one had 100.0 g at the beginning, how many grams would be left after 7.2 minutes has elapsed?

7. After 24.0 days, 8.00 milligrams of an original 128.0 milligram sample remain. What is the half-life of the sample?

ANSWERS

1. If the half-life of iodine-131 is 8.10 days, how long will it take a 50.00 g sample to decay to 6.25 g?

*50.0 g 🡪 25.0 g 🡪 12.5 g 🡪 6.25 g … 3 half-lives*

*3 x 8.10 days/half-life = 24.30 days*

2. Chromium-48 has a short half-life of 21.6 hours. In theory how long will it take 360.00 g of chromium-48 to decay to 11.25 g?

*360.00 g 🡪 180.00 g 🡪 90.00 g 🡪 45.00 g 🡪 22.50 g 🡪 11.25 g … 5 half lives*

*5 x 21.6 hours/half-life = 108 hours*

3. Potassium-42 has a half-life of 12.4 hours. How much of an 848 g sample of potassium-42 will be left after 62.0 hours?

*62.0 hours / 12.4 hours/half-life = 5 half lives*

*848 g 🡪 424 g 🡪 212 g 🡪 106 g 🡪 53 g 🡪 26.5 g*

4. Carbon-14 has a half-life of 5730 years. How much of a 144 g sample of carbon-14 will remain after 1.719 x 104 years?

*1.719 x 104 years / 5730 years/half-life = 3 half-lives*

*144 g 🡪 72 g 🡪 36 g 🡪 18 g*

5. Suppose you find a shark tooth on the beach and estimate it is 15,000 years old. Would you use 238U or 14C to confirm the date of the tooth? Explain.

*You would use radioactive carbon dating because the object is organic (formerly living) and because it is too young to be accurately dated by using 238U.*

6. The half-life of Zn-71 is 2.4 minutes. If one had 100.0 g at the beginning, how many grams would be left after 7.2 minutes has elapsed?

*7.2 / 2.4 = 3 half-lives*

*100.0 g 🡪 50.0 g 🡪 25.0 g 🡪 12.5 g*

7. After 24.0 days, 8.00 milligrams of an original 128.0 milligram sample remain. What is the half-life of the sample?

*128.0 g 🡪 64.0 g 🡪 32.0 g 🡪 16.0 g 🡪 8.0 g … 4 half lives*

*24 days / 4 half lives = 6 days / half life*