

Name : _____ Date : _____

Half-life of Radioactive Isotopes Worksheet

1. The half-life of iodine-125 is 60 days. What fraction of iodine-125 is left after 360 days?
2. Titanium-51 decays with a half-life of 6 minutes. What fraction of a sample of titanium would remain after an hour?
3. Polonium-218 has a half-life of 3 minutes. How much of a sample that initially had 200 atoms will last after 30 minutes?
4. Gold-198 has a half-life of 2.69 days. How long will it take a sample weighing 180 grams to decay to an $\frac{1}{8}$ th of its original mass?
5. Bismuth-214 has a half-life of 20 minutes. How many grams of a bismuth-214 sample weighing 64 grams will be left after an hour?
6. Chromium-51 has a half-life of 28 days. What fraction remains after a year?

Half-life of Radioactive Isotopes Worksheet

Answers

1. The half-life of iodine-125 is 60 days. What fraction of iodine-125 is left after 360 days?

$$1/64^{\text{th}}$$

After 360 days, iodine-125 passes through 6 half-lives ($360/60 = 6$). So the fraction left is $(1/2)^6 = 1/64^{\text{th}}$.

2. Titanium-51 decays with a half-life of 6 minutes. What fraction of a sample of titanium would remain after an hour?

$$1/1024^{\text{th}}$$

After an hour, titanium-51 passes through 10 half-lives ($60/6 = 10$). So the fraction left is $(1/2)^{10} = 1/1024^{\text{th}}$.

3. Polonium-218 has a half-life of 3 minutes. How much of a sample that initially had 200 atoms will last after 30 minutes?

$$0.195 \text{ grams}$$

After 30 minutes, the sample has passed through 10 half-lives. So the amount of the sample left is $= (1/2)^{10} \times 200 = 0.195 \text{ grams}$

4. Gold-198 has a half-life of 2.69 days. How long will it take a sample weighing 180 grams to decay to an $1/8^{\text{th}}$ of its original mass?

$$8.07 \text{ days}$$

To decay to an $1/8^{\text{th}}$ of its original mass, gold-198 must pass through 3 half-lives. So it takes the sample $= 3 \times 2.69 = 8.07 \text{ days}$ to decay.

5. Bismuth-214 has a half-life of 20 minutes. How many grams of a bismuth-214 sample weighing 64 grams will be left after an hour?

$$8 \text{ grams}$$

In one hour, the sample will pass through $60/20 = 3$ half-lives. So after an hour, the amount of bismuth-214 left is $= (1/2)^3 \times 64 = 8 \text{ grams}$

6. Chromium-51 has a half-life of 28 days. What fraction remains after a year?

$$1/8192^{\text{th}}$$

The number of half-lives chromium-51 passes through in a year is $365/28 = 13$. So the fraction of its left after a year is $= (1/2)^{13} = 1/8192^{\text{th}}$