

Half-life Practice Worksheet

1. Actinium-226 has a half-life of 29 hours. If 10 g of actinium-226 disintegrates over 145 hours, how much of the sample will remain?
2. If carbon-14 has a half-life of 5730 years, how much time has passed if 5 half-lives have gone by?
3. The half-life of Po-218 is 3 minutes. How many atoms of a sample consisting of 200 atoms will be left after 15 minutes?
4. How much of a sample of 18 grams of sodium-24 (half-life = 15 hours) is left after 60 hours?
5. Iodine-131 has a half-life of 8 days. What fraction of the original sample would remain after 32 days?
6. How old is a skeleton sample if the current amount of carbon in the bones is 3.125%?
(Assume you started with 100% and the half-life of carbon-14 is 5,730 years)

Half-life Practice Worksheet

Answers

1. Actinium-226 has a half-life of 29 hours. If 10 g of actinium-226 disintegrates over 145 hours, how much of the sample will remain?

0.625 grams

312.5 mg

As the half-life of actinium-226 is 29 hours and the disintegration has gone for as long as 145 hours, a total of 5 half-lives ($145/29 = 5$) has passed. So the amount of actinium-226 left is $= 1/2^5 \times 10 \text{ g} = 0.3125 \text{ g}$ or 312.5 mg.

2. If carbon-14 has a half-life of 5730 years, how much time has passed if 5 half-lives have gone by?

28,650 years

Time passed = $5730 \times 5 \text{ years} = 28650 \text{ years}$

3. The half-life of Po-218 is 3 minutes. How many atoms of a sample consisting of 200 atoms will be left after 15 minutes?

6.25 atoms

Total half-lives passed = $15/3 = 5$ half-lives. So after 5 half-lives, the amount of atoms left is $= 1/2^5 \times 200 = 6.25$

4. How much of a sample of 18 grams of sodium-24 (half-life = 15 hours) is left after 60 hours?

1.125 grams

Total half-lives passed = $60/15 = 4$ half-lives. So after 4 half-lives, the amount of the sample left is $= 1/2^4 \times 18 = 1.125 \text{ grams}$

5. Iodine-131 has a half-life of 8 days. What fraction of the original sample would remain after 32 days?

1/16th

Total half-lives passed = $32/8 = 4$ half-lives. So after 4 half-lives, the amount of the sample left is $= 1/2^4 = 1/16$

6. How old is a skeleton sample if the current amount of carbon in the bones is 3.125%? (Assume you started with 100% and the half-life of carbon-14 is 5,730 years)

28,650 years

If we start with the assumption that the skeleton sample was 100% carbon in the beginning, to reach 3.125%, it passed through 5 half-lives ($100\% \rightarrow 50\% \rightarrow 25\% \rightarrow 12.5\% \rightarrow 6.25\% \rightarrow 3.125\%$). So, the age of the sample is $= 5 \times 5730 = 28650 \text{ years}$