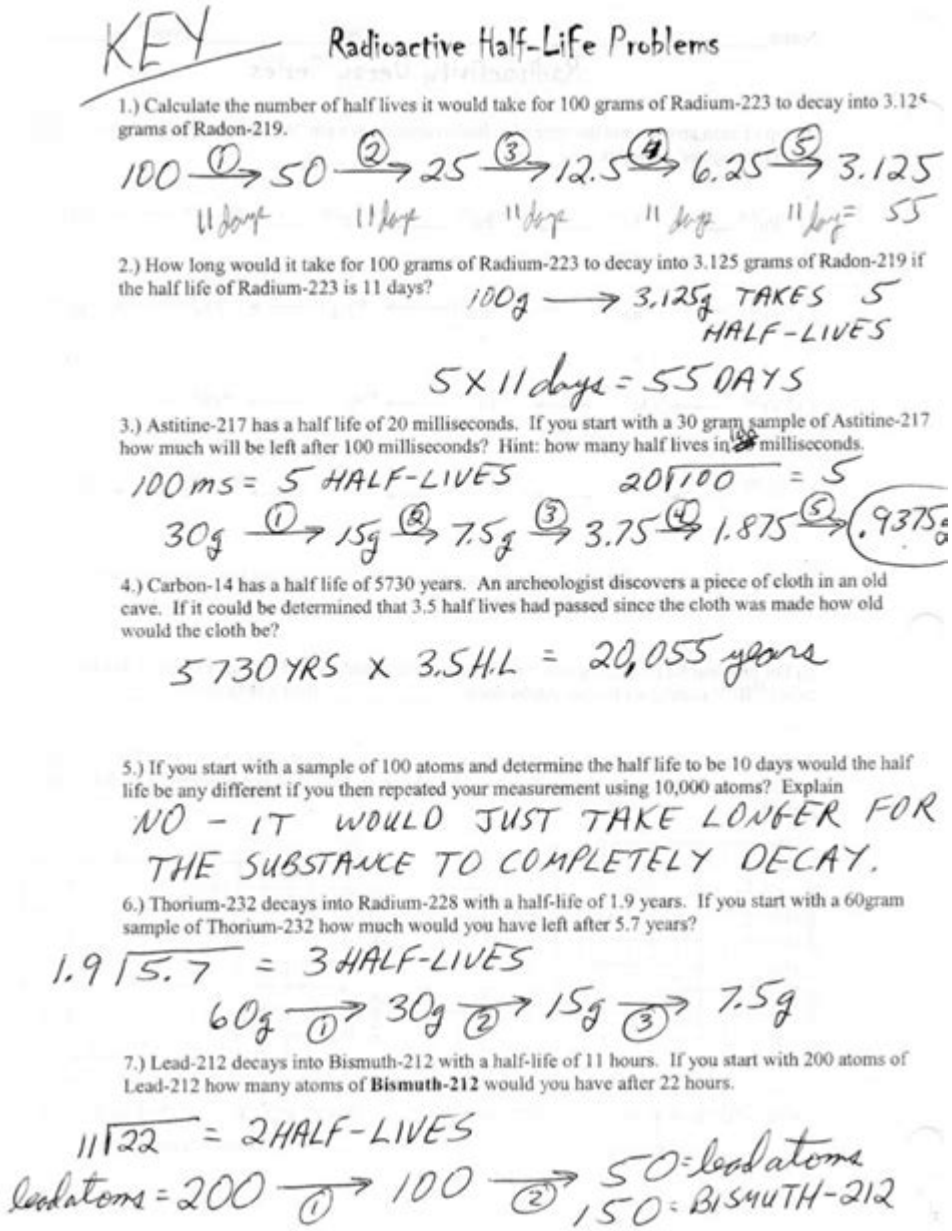
Half Life Practice Worksheet Answers



KEY Radioactive Half-Life Problems

1.) Calculate the number of half lives it would take for 100 grams of Radium-223 to decay into 3.125 grams of Radon-219.

100 → ① 50 → ② 25 → ③ 12.5 → ④ 6.25 → ⑤ 3.125

11 days 11 days 11 days 11 days 11 days = 55

2.) How long would it take for 100 grams of Radium-223 to decay into 3.125 grams of Radon-219 if the half life of Radium-223 is 11 days?

100g → 3.125g TAKES 5 HALF-LIVES

5 × 11 days = 55 DAYS

3.) Astitine-217 has a half life of 20 milliseconds. If you start with a 30 gram sample of Astitine-217 how much will be left after 100 milliseconds? Hint: how many half lives in 100 milliseconds.

100 ms = 5 HALF-LIVES 20 | 100 = 5

30g → ① 15g → ② 7.5g → ③ 3.75 → ④ 1.875 → ⑤ .9375g

4.) Carbon-14 has a half life of 5730 years. An archeologist discovers a piece of cloth in an old cave. If it could be determined that 3.5 half lives had passed since the cloth was made how old would the cloth be?

5730 YRS × 3.5 H.L = 20,055 years

5.) If you start with a sample of 100 atoms and determine the half life to be 10 days would the half life be any different if you then repeated your measurement using 10,000 atoms? Explain

NO - IT WOULD JUST TAKE LONGER FOR THE SUBSTANCE TO COMPLETELY DECAY.

6.) Thorium-232 decays into Radium-228 with a half-life of 1.9 years. If you start with a 60gram sample of Thorium-232 how much would you have left after 5.7 years?

1.9 | 5.7 = 3 HALF-LIVES

60g → ① 30g → ② 15g → ③ 7.5g

7.) Lead-212 decays into Bismuth-212 with a half-life of 11 hours. If you start with 200 atoms of Lead-212 how many atoms of **Bismuth-212** would you have after 22 hours.

11 | 22 = 2 HALF-LIVES

lead atoms = 200 → ① 100 → ② 50 = lead atoms, 150 = BISMUTH-212

Half life practice worksheet answers are essential resources for students and educators alike in mastering the concept of half-life in nuclear physics and chemistry. Understanding half-life is crucial for applications in various fields, including medicine, environmental science, and archaeology. In this article, we will explore the concept of half-life, provide practice problems, and discuss the answers to those problems, enhancing the comprehension of this fundamental principle.

Understanding Half-Life

Half-life is defined as the time required for half of the radioactive atoms in a sample to decay. This concept is critical in understanding how substances change over time and is expressed mathematically. The formula

for half-life can be represented as:

$$ N(t) = N_0 \left(\frac{1}{2} \right)^{\frac{t}{t_{1/2}}} $$

Where:
- $ N(t) $ = remaining quantity of the substance
- $ N_0 $ = initial quantity of the substance
- $ t $ = elapsed time
- $ t_{1/2} $ = half-life of the substance

Key Characteristics of Half-Life

- Constant Value: The half-life of a substance is constant, regardless of the amount present.
- Exponential Decay: The decay of radioactive substances follows an exponential pattern, which means that the quantity decreases rapidly at first and then slows down over time.
- Independent of Conditions: Half-life remains unchanged under varying physical conditions like temperature and pressure.

Applications of Half-Life

Understanding half-life has several practical applications:

1. Medicine: In pharmacology, half-life helps determine dosing schedules for medications.
2. Radiometric Dating: Archaeologists use half-life to date ancient artifacts and fossils.
3. Nuclear Energy: In nuclear reactors, understanding half-life is crucial for managing waste and understanding fuel decay.

Half-Life Practice Problems

To grasp the concept of half-life, it is beneficial to solve practice problems. Below are some examples of problems along with their solutions.

Problem 1: Basic Half-Life Calculation

A radioactive isotope has a half-life of 5 years. If you start with 80 grams of the isotope, how much will remain after 15 years?

Solution:
1. Determine how many half-lives have passed: $15 \text{ years} \div 5 \text{ years/half-life} = 3$ half-lives.
2. Calculate the remaining amount:

$$
N(t) = N_0 \left(\frac{1}{2} \right)^3 = 80 \left(\frac{1}{2} \right)^3 = 80 \times \frac{1}{8} = 10 \text{ grams}
$$

Problem 2: Finding Half-Life from Decay Data

A sample of a radioactive substance decays from 200 grams to 25 grams in 15 years. What is the half-life of the substance?

Solution:
1. Determine the number of half-lives:

$$
200 \text{ grams} \rightarrow 100 \text{ grams} \rightarrow 50 \text{ grams} \rightarrow 25 \text{ grams}
$$

This shows that 3 half-lives have passed.
2. Calculate the half-life:

$$
\text{Total time} = 15 \text{ years} \Rightarrow t_{1/2} = \frac{15 \text{ years}}{3} = 5 \text{ years}
$$

Problem 3: Using the Half-Life Formula

A certain isotope has a half-life of 10 days. If you start with 1000 mg, how much will remain after 30 days?

Solution:
1. Find the number of half-lives:

$$
30 \text{ days} \div 10 \text{ days/half-life} = 3 \text{ half-lives}
$$

2. Calculate the remaining amount:

$$
N(t) = 1000 \left(\frac{1}{2} \right)^3 = 1000 \times \frac{1}{8} = 125 \text{ mg}
$$

Problem 4: Compound Interest Analogy

A certain substance has a half-life of 6 months. If you have 400 grams, how much will be left after 1.5 years?

Solution:
1. Convert the time to months: $1.5 \text{ years} = 18 \text{ months}$.
2. Calculate the number of half-lives:
$$
18 \text{ months} \div 6 \text{ months/half-life} = 3 \text{ half-lives}
$$
3. Calculate the remaining quantity:
$$
N(t) = 400 \left(\frac{1}{2} \right)^3 = 400 \times \frac{1}{8} = 50 \text{ grams}
$$

Half-Life Practice Worksheet Answers

Now, let's summarize the answers to the practice problems mentioned above:

1. Problem 1: 10 grams remaining after 15 years.
2. Problem 2: The half-life of the substance is 5 years.
3. Problem 3: 125 mg remaining after 30 days.
4. Problem 4: 50 grams remaining after 1.5 years.

Conclusion

Half-life is a fundamental concept that has significant implications in various scientific disciplines. Mastering the calculations related to half-life can enhance understanding and application in real-world scenarios. Through practice problems and their solutions, students can gain confidence in applying these principles effectively. As we continue to explore and experiment, the knowledge of half-life will remain a valuable asset in the scientific community. Whether for academic purposes or practical applications, half-life practice worksheets and their answers serve as a critical learning tool.

Frequently Asked Questions

What is the half-life of a substance?

The half-life of a substance is the time required for half of the substance to decay or be eliminated.

How can I calculate the remaining amount of a substance after several half-lives?

To calculate the remaining amount, use the formula: remaining amount = initial amount (1/2)^(number of half-lives).

Where can I find practice worksheets for half-life problems?

Practice worksheets can be found on educational websites, in textbooks, or through online resource platforms like Khan Academy and Teachers Pay Teachers.

What are some common applications of half-life in real life?

Common applications include radioactive decay in nuclear physics, pharmacokinetics in medicine, and carbon dating in archaeology.

How do I interpret the answers on a half-life practice worksheet?

Interpret the answers by checking if they accurately reflect the calculations based on the initial amount, half-life period, and elapsed time.

Can I use a calculator for half-life calculations?

Yes, a scientific calculator can be used to perform calculations involving exponential decay and logarithms related to half-life.

What is an example of a half-life calculation?

If you start with 100 grams of a substance with a half-life of 3 years, after 6 years (2 half-lives), you will have 25 grams remaining.

Are there online tools to check half-life practice worksheet answers?

Yes, there are online calculators and educational platforms that allow you to input data and verify your half-life calculations.

What should I do if I get stuck on a half-life worksheet problem?

If you get stuck, try reviewing the concepts, checking examples, or asking for help from a teacher or tutor.

Half Life Practice Worksheet Answers

Amazon.com: 8x8 Pan With Lid
8x8 Disposable Aluminum Pans With Lids - 20 Pack Foil Pans For Cooking, Baking Cakes, Roasting & Homemade Breads - Disposable Food Containers With Foil Lids Aluminum

8x8 Baking Pan - Walmart.com
8 inch Square Cake Pan with Lid, Vesteel Non-Stick Stainless Steel Rectangle Brownies Baking Pan Set of 4, Non-Toxic & Warp Resistant, Rust Free & Dishwasher Safe (2 Pans + 2 Lids)

8" (20cm) Square Pan With Lid - Shop | Pampered Chef US Site
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Amazon.com: Pyrex 8x8 Baking Dish With Lid
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The aim of the study was to identify the effect of explicit instruction of metacognitive reading strategies on undergraduate students' online reading comprehension.

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One treatment group and one comparison group, a total of 59 university freshmen in Macao SAR participated in this study. All six groups of LLS (memory-related, cognitive, compensatory, …

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2.3. Metacognitive instruction The concept of metacognition, introduced by Flavell (1979) in cognitive psychology, encompasses knowing and thinking about one's cognitive processes.