

## Radioactivity and Half-Lives Review Worksheet

1. What is the difference between radioactivity and nuclear radiation?

**Radioactivity is the process of nuclear decay (an unstable isotope emitting energy/a particle to become more stable). Nuclear radiation is that energy or particle being emitted.**

2. Which type of radiation can be blocked by---

- a. A piece of paper? **alpha**
- b. A piece of wood? **beta**
- c. A large block of concrete? **gamma**

Extension opportunity: Why? *What do we know about the size of each type of particle that affects their ability to pass through materials?* **Alpha particles are the largest, so they move the slowest and cannot penetrate objects as easily. Gamma particles are the smallest and have no charge, so they penetrate more easily.**

3. What is a half-life?

**The time it takes for half of the material you started with to decay.**

4. If we start with 400 atoms of a radioactive substance, how many would remain after one half-life? **200** After 2 half-lives? **100** After 3 half-lives? **50** After 4 half-lives? **25**

5. If we start with 16 grams of a substance, how much will remain after 3 half-lives?  
 $16 \rightarrow 8 \rightarrow 4 \rightarrow 2$  **2 grams** after 3 half-lives.

6. A sample of carbon-14 has been decaying for 22,920 years and is now 35.0 grams. What was the size of the original sample? (The half-life of carbon-14 is 5,730 years)  
 $22920/5730 = 4$  half lives *You will need to work backwards*  
 $35 \rightarrow 70 \rightarrow 140 \rightarrow 280 \rightarrow$  **560. grams**

7. How old is a skeleton sample if the current amount of carbon in the bones is 3.125%? (Assume you started with 100%)  
 $100\% \rightarrow 50 \rightarrow 25 \rightarrow 12.5 \rightarrow 6.25 \rightarrow 3.125$  5 half lives  $\times 5,730 =$  **28,650 years**

8. If you started with 120 grams of a radioactive substance, and now you have 15 grams, how many half-lives have passed?  
 $120 \rightarrow 60 \rightarrow 30 \rightarrow 15$  **3 half-lives**

9. The half-life of isotope X is 2.0 years. How many years would it take for a 4.0 mg sample of isotope X to decay and have only 0.50 mg of it remain?  
 $4.0 \rightarrow 2.0 \rightarrow 1.0 \rightarrow 0.50$  3 half lives  $\times 2$  years = **6.0 years**

# Half Life Calculations Worksheet Answer Key

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