Name Class Date

**Half-life Calculations**

1. Define **half-life**.

1. Use references to find the half-life of each of the following radioactive isotopes. (*Data Booklet*)
	1. carbon-14
	2. 
	3. Th-235
	4. 
2. What fraction of the original atoms of radioactive sample will remain after the given number of half-lives has passed?

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number half-lives passed** | **0** | **1** | **2** | **3** | **4** | **5** | **6** |
| **Fraction of atoms remaining** |  |  |  |  |  |  |  |

1. Iodine-131 is used in radiotherapy of the thyroid gland and has half-life 8 days. What fraction of the dose given a patient will remain 24 days after the treatment?
2. A phosphorus-32 sample originally had mass 20 grams. After 28 days, only 5.0 grams of it remained. How many half-lives have passed? What is the half-life of ?
3. Bits of bone are found at an archeological dig. The amount of carbon-14 left in the bones is 1/16 as much as living bones contain. Determine the number of half-lives that has passed since the animal died, then calculate the bones’ age in years. (Round to the hundreds of years.)

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| **Isotope** | **t1/2** |
| carbon-11 | 20.3 minutes |
| carbon-12 | NA |
| carbon-14 | 5715 years |

1. The table at right lists three isotopes of carbon and the half-life of each.
2. Which of these is most stable? Explain.
3. Why is carbon-14 used for radioisotope dating of artifacts rather than either of the other two isotopes?

**Half-life Practice Worksheet**

1. Sodium-24 has a half-life of 15 hours. How much sodium-24 will remain in an 18.0 g sample after 60 hours?
2. After 42 days a 2.0 g sample of phosphorus-32 contains only 0.25 g of the isotope. What is the half-life of phosphorus-32?
3. Polonium-214 has a relatively short half-life of 164 seconds. How many seconds would it take for 8.0 g of this isotope to decay to 0.25 g?
4. How many days does it take for 16 g of palladium-103 to decay to 1.0 g? The half-life of palladium-103 is 17 days.
5. By approximately what factor would the mass of a sample of copper-66 decrease in 51 minutes? The half-life of copper-66 is 5.10 minutes.
6. In 5.49 seconds, 1.20 g of argon-35 decay to leave only 0.15 g. What is the half-life of argon-35?