Name: \_\_\_\_\_\_\_\_\_\_\_\_\_ANSWER KEY\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_

**Radioactivity and Half-Lives Review Worksheet**

1. What is a half-life?

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

1. 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

1. If we start with 16 grams of a substance, how much will remain after 3 half-lives?

16 🡪 8 🡪 4 🡪 2 2 grams after 3 half-lives.

1. 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 🡪 70 🡪 140 🡪 280 🡪 560. grams

1. How old is a skeleton sample if the current amount of carbon in the bones is 3.125%? (Assume you started with 100%)

100% 🡪 50 🡪 25 🡪 12.5 🡪 6.25 🡪 3.125 5 half lives x 5,730 = 28,650 years

1. If you started with 120 grams of a radioactive substance, and now you have 15 grams, how many half-lives have passed?

120 🡪 60 🡪 30 🡪 15 3 half-lives

1. 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 🡪 2.0 🡪 1.0 🡪 0.50 3 half lives x 2 years = 6.0 years

1. The half-life of Po-218 is three minutes. How much of a 200 atom sample will remain after 15 minutes?

15 minutes/3 = 5 half lives 200 🡪 100 🡪 50 🡪 25 🡪 12.5 🡪 6.25 atoms

1. The half-life of Au-198 is 2.69 days. How long does it take a 180g sample to decay to 1/8 its original mass?

1 🡪 ½ 🡪 ¼ 🡪 1/8 3 half lives x 2.69 days = 8.07 days

1. What is the half-life of a radioactive sample if 100.0 grams of it decays to 12.5 grams in 24.3 hours?

100 🡪 50 🡪 25 🡪 12.5 24.3/3 half lives = 8.10 hours

1. How long will it take a sample of 131I to decay to 12.5% assuming its half-life is 8.07 days?

100% 🡪 50 🡪 25 🡪 12.5 3 half lives x 8.07 = 24.2 days

1. Sodium-25 was to be used in an experiment, but it took 3.0 minutes to get the sodium from the reactor to the laboratory. If 5.0 mg of sodium-25 was removed from the reactor, how many mg of sodium-25 were placed in the reaction vessel 3.0 minutes later if the half-life of sodium-25 is 60 seconds?

3 minutes / 60 seconds = 3 half lives 5🡪2.5 🡪 1.25 🡪 0.625mg

1. Actinium-226 have a half-life of 29 hours. If 10.0 **g** of actinium-226 disintegrates over a period of 145 hours, how many **mg** of actinium-226 will remain? *\*\*You need to do dimensional analysis to solve this one! \*\**

145 / 29 = 5 half lives 10.0g 🡪 5.0 🡪 2.5 🡪 1.25 🡪 0.625 🡪 0.3125g



0.3125 g x 103 mg = 312.5 mg

 1 g