

CLASS COPY! DO NOT TAKE!

Half Life Practice Problems

Name: _____ Date: _____ Period: _____

1. What percentage of a radioactive element will be left after:

- a. 1 half-life _____ b. 2 half-lives _____ c. 3 half-lives _____

2. How many half-lives have passed for each of the following samples:

- a. 50% of the original radioactive material remains _____
b. 25% of the original radioactive sample remains _____
c. 12.5% of the original radioactive sample remains _____

3. If a rock sample originally contained 12 g of Uranium-235, how much will be left after:

- a. 1 half-life _____ b. 2 half-lives _____ c. 3 half-lives _____

4. Uranium-235 has a half-life of 700 million years. How much of the 12 g sample of Uranium-235 will be left after :

- a. 700 million years _____ b. 1400 million years _____

5. Carbon-14 is a radioactive element that decays into Nitrogen-14. The half-life of Carbon-14 is 5730 years. What percentage of Carbon-14 and Nitrogen-14 will be left in a dinosaur bone after:

- | | | |
|----------------------|----------------------|------------------------|
| 5730 years: | % of Carbon-14 _____ | % of Nitrogen-14 _____ |
| 11,580 years: | % of Carbon-14 _____ | % of Nitrogen-14 _____ |
| 17,310 years: | % of Carbon-14 _____ | % of Nitrogen-14 _____ |

6. If the dinosaur bone in question 5 originally had 16 grams of Carbon-14 in it how much of each type of element should be left after:

- | | | |
|----------------------|--------------------------|----------------------------|
| 5730 years: | Grams of Carbon-14 _____ | Grams of Nitrogen-14 _____ |
| 11,580 years: | Grams of Carbon-14 _____ | Grams of Nitrogen-14 _____ |
| 17,310 years: | Grams of Carbon-14 _____ | Grams of Nitrogen-14 _____ |

7. More dinosaur bones are found and examined. If they contain the following percentages of Carbon-14 and Nitrogen-14 how old are each of the bones?

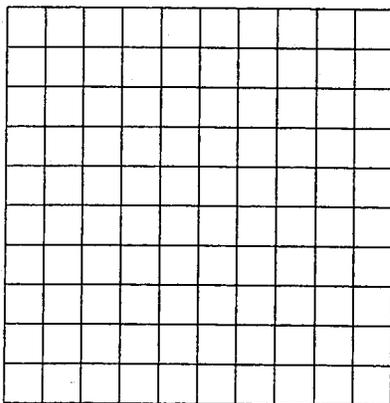
Bone #1: 50% Carbon-14 and 50% Nitrogen-14 _____ years old

Bone #2: 25% Carbon-14 and 75% Nitrogen-14 _____ years old

Bone #3: 12.5% Carbon-14 and 87.5% Nitrogen-14 _____ years old

8. Scientists have recently discovered a new type of radioactive element. They have measured its half-life and know it takes 10,000 years to decay. Use their data in the table below to plot a line on the graph below.

Number of Half Lives	% of Unstable Atom Remaining
0	100
1	50
2	25
3	12.5
4	6.25
5	3.125



9. A fossil bone has 25% of this new radioactive element remaining. How many half-lives have passed?

10. If the half-life of this new element is 10,000 years, how old is the fossil bone in question 9?

Dougherty Valley HS
Chemistry – Nuclear Review

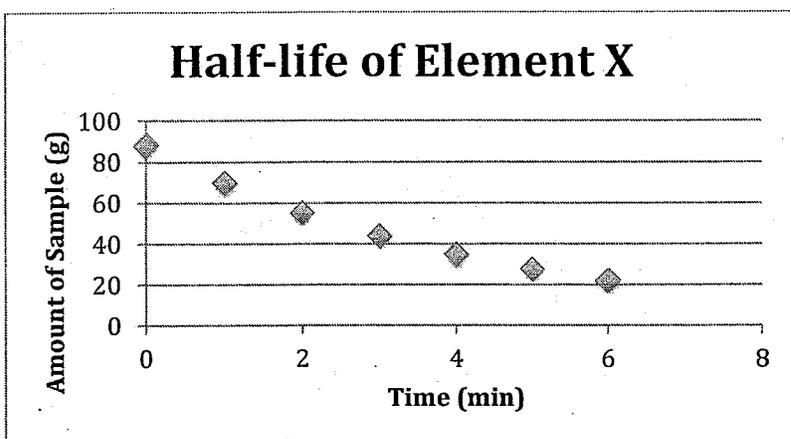
- How many particles make up the nucleus of an atom and what are they?
- Why do we say that the mass of an atom is in the nucleus?
- What are the Five decay particles discussed in class. What are their names, symbols, charge, and Structure?

Name	Alpha	Beta	Gamma	Neutron	Positron
Symbol	${}^4_2\text{He}$	${}^0_{-1}\beta$	${}^0_0\gamma$	${}^1_0\text{n}$	${}^0_{+1}\beta$
Charge	+2	-1	0	0	+1
Structure	2 protons 2 neutrons	Fast moving negative particle	Photon	One Neutron	Fast moving positive particle

- Complete the nuclear reactions below. Question marks are unknown elements.
 - ${}^{11}_6\text{C} \rightarrow {}^0_{+1}\beta + ?$
 - ${}^{238}_{92}\text{U} \rightarrow {}^{234}_{90}\text{Th} + ?$
 - ${}^{234}_{88}\text{Th} \rightarrow {}^0_0\gamma + ?$
 - ${}^{24}_{11}\text{Na} \rightarrow {}^{24}_{12}\text{Mg} + ?$
 - positron emission from sulfur-31.
 - Krypton-76 undergoes electron capture.
 - Neutron initiated fission of U-235 results in the release of 2 neutrons, the formation of Cs-144 and another nucleus.
 - Bombardment of Cl-35 with a neutron produces a sulfur-34 nucleus and another particle.
 - Bismuth-214 can take two paths using Alpha and Beta decay to produce a new nucleus. Write out the equation for the two paths. What are the intermediate products and the final product?
 - ${}^1_0\text{n} + {}^{235}_{92}\text{U} \rightarrow 3{}^1_0\text{n} + {}^{92}_{36}\text{Kr} + ?$
 - ${}^{238}_{92}\text{U} \rightarrow {}^{234}_{90}\text{Th} + {}^4_2\text{He} \rightarrow {}^0_0\gamma + ?$
 - ${}^1_0\text{n} + {}^{235}_{92}\text{U} \rightarrow 4{}^0_{-1}\beta + {}^{90}_{38}\text{Sr} + ?$
 - $2{}^3_1\text{H} \rightarrow 2{}^1_0\text{n} + ?$

10. If the half-life for the radioactive decay of zirconium-84 is 26 minutes and I start with a 175 gram sample, how much will be left over after 104 minutes?

11. Using the graph below determine the half-life of the radioactive element x.



12. Element-106 has a half-life of 0.90 seconds. If one million atoms of it were prepared, how many atoms would remain after 4.5 seconds?

13. Actinium-226 has a half-life of 29 hours. If 100 mg of actinium-226 disintegrates over a period of 58 hours, how many mg of actinium-226 will remain?

14. What is the half-life of a nucleotide that loses 65% of a 200g sample in 10 years?