HALF-LIFE PROBLEMS

Name_____ Block _____

1. An isotope of cesium (cesium-137) has a half-life of 30 years. If 1.0 g of cesium-137 disintegrates over a period of 90 years, how many g of cesium-137 would remain?

2. 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?

3. 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?

4. The half-life of isotope X is 2.0 years. How many years would it take for a 4.0 mg sample of X to decay and have only 0.50 mg of it remain?

5. Selenium-83 has a half-life of 25.0 minutes. How many minutes would it take for a 10.0 mg sample to decay and have only 1.25 mg of it remain?

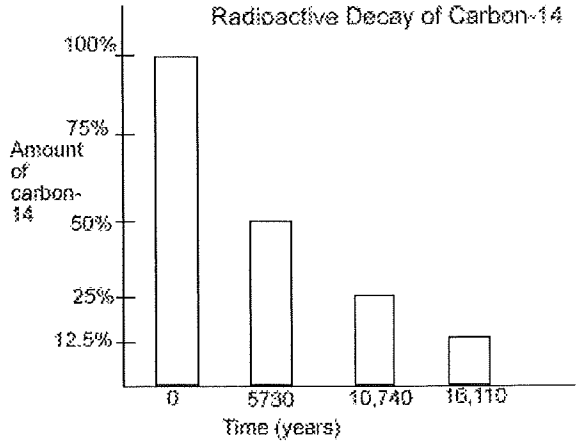
6. The half-life of Po-218 is three minutes. How much of a 2.0 gram sample remains after 15 minutes? Suppose you wanted to buy some of this isotope, and it required half an hour for it reach you. How much should you order if you need to use 0.10 gram of this material?

Half-life Worksheet **Nuclear Changes** **Integrated Science**

Name _____ **Date:** _____

1. What is *radioactivity*? _____
   _____
2. What is *nuclear radiation*? _____
   _____
3. What is *half-life*? _____
   _____
4. If we start with 400 atoms of a radioactive substance, how many would remain after one half-life?_____ after two half-lives? _____ after three half-lives? _____ after four half-lives? _____
5. If we start with 48 atoms of a radioactive substance, how many would remain after one half-life?_____ after two half-lives? _____ after three half-lives? _____ after four half-lives? _____
6. If we start with 16 grams of a radioactive substance, how much will remain after three half-lives?
   _____
7. If we start with 120 atoms of a radioactive substance, how many will remain after three half-lives?
   _____

Use the following graph to answer questions 8-11…



8. How long is a half-life for carbon-14?
   _____
9. If only 25% of the carbon-14 remains, how old is the material containing the carbon-14?
   _____
10. If a sample originally had 120 atoms of carbon-14, how many atoms will remain after 16,110 years? _____
11. If a sample known to be about 10,740 years old has 400 carbon-14 atoms, how many atoms were in the sample when the organism died? _____

12. Which type of nuclear radiation (beta particles, gamma rays, or alpha particles) can be blocked by…
a) a piece of paper _____

b) a block of wood _____
c) a piece of lead _____

Use the following chart to answer questions 13-16...

Radioactive Substance	Approximate half-life
Radon-222	4 days
Iodine-131	8 days
Radium-226	1600 years
Carbon-14	5,730 years
Plutonium-239	24,120 years
Uranium-238	4,470,000,000

13. If we start with 8000 atoms of radium-226, how much would remain after 3,200 years? _____

14. If we start with 20 atoms of plutonium-239, how many would remain after 48,240 years? _____

15. If we start with 60 atoms of uranium-238, how many remain after 4,470,000,000 years? _____

16. If we start with 24 atoms of iodine-131, how many remain after 32 days? _____

HALF-LIFE WORKSHEET Name _____

Use Reference Table on side to assist you in answering the following questions.
Equations:

½ lifes:
As-81 = 33 seconds
Au-198 = 2.69 days
C-14 = 5730 years

1 How long does it take a 100.00g sample of As-81 to decay to 6.25g?

2. How long does it take a 180g sample of Au-198 to decay to 1/8 its original mass?

3. What percent of a sample of As-81 remains un-decayed after 43.2 seconds?

4. What is the half-life of a radioactive isotope if a 500.0g sample decays to 62.5g in 24.3 hours?

5. How old is a bone if it presently contains 0.3125g of C-14, but it was estimated to have originally contained 80.000g of C-14?