Carbon Dating Practice

**The half- life of Carbon-14 is approximately 5000 years. Carbon-14 undergoes beta decay and turns into N-14 which is stable. Calculate the percentage of Carbon-14 would be present in the fossil and number of half lives that have occurred since the death of the organism Begin at time = 0, and show the percent of Carbon-14 that would be present after each half-life. Keep in mind a half live reduces the amount of current C-14 by half!!**

Time = 0, organism dies \_\_\_\_\_\_\_\_\_\_\_\_\_\_% Carbon-14 present

Time = 1 half life \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_% Carbon-14 present

Time = 2 half lives\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_% Carbon-14 present

Time= 3 half lives \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ % Carbon-14 present

Time= 4 half-lives\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ % Carbon-14 present

Time= 5 half-lives\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_% Carbon-14 present

Time= 6 half-lives\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_% Carbon-14 present

Time= 7 half-lives\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_% Carbon-14 present

Time= 8 half-lives\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_% Carbon-14 present

**Also complete the following chart using carbon which has a half life of approximately 6,000 years.**

|  |  |  |  |
| --- | --- | --- | --- |
| Number of **half-lives** that have passed | **Years** since the death of the organism | Percentage of **Carbon-14** remaining in the organism | Percentage of **Nitrogen-14** in the organism |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**Half-life Practice #1 Nuclear Changes**

1. If we start with 400 atoms of a radioactive substance, how many would remain after one halflife?\_\_\_\_after two half-lives? \_\_\_\_\_ after three half-lives? \_\_\_\_\_\_\_ after four halflives?\_\_\_

2. If we start with 48 atoms of a radioactive substance, how many would remain after one halflife?\_\_\_\_after two half-lives? \_\_\_\_ after three half-lives? \_\_\_\_\_\_ after four halflives?\_\_\_\_

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

4. If we start with 120 atoms of a radioactive substance, how many will remain after three half-lives?\_\_\_\_\_\_\_\_\_

5. 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 \_\_\_\_\_\_\_



6. How long is a half-life for carbon-14?\_\_\_\_\_\_\_\_\_\_\_

7. If only 25% of the carbon-14 remains, how old is the material containing the carbon-14?\_\_

8. If a sample originally had 120 atoms of carbon-14, how many atoms will remain

after 16,110 years? \_\_\_\_\_\_\_

9. 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? \_\_\_\_\_\_\_\_\_

**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

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

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

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

13. If we start with 24 atoms of iodine-131, how many remain after 32 days? \_\_\_\_\_\_\_\_\_\_\_

# HALF-LIFE Problems #2

1 How long in days does it take a 100.00g sample of Au-l 98 to decay to 6.25g?

2. How long in days does it take a sample of Au-198 to decay to 12.5% of its original mass?

3. How many half-lives will pass by the time a 60.0g sample of Co-60 decays to 7.59?

4.What percent of a sample of N-16 remains undecayed after 43.2 seconds?

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

6. 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?

7. What is the half-live of a radioactive isotope if it takes 6.2 days for a 72g sample to decay to 18g?

8. Cs-137 is produced as a waste product in nuclear fission reactors. What percent remains undecayed after 241.84 years?

9. How many half-lives of K-37 will pass after 6.15 seconds?

**½ Life Time Name**

2.69 d – gold-198 7.2 s – nitrogen-16

5730 y – carbon-14 1.23 s + potassium-37

5.26 y – cobalt-60 12.26 y – hydrogen-3

30.23 y – cesium-137

s = seconds; d = days; y = years

# HALF-LIFE WORKSHEET #3

1.If a 700.00g sample of I-131 decays to 43.75g, how much time has passed?

2. How long will it take a 3.5g sample of Fr-220 to decay so that only 25% of the original amount of Fr-220 remains?

3. What is the half-life of a radioisotope if 3.125% of it remains undecayed after 26.4 days?

4. H-3 (tritium) is an artificially produce radioisotope used in some nuclear reactions. How much of a 100 kg sample of H-3 remains undecayed after 85.82 years?

5. If a radioactive sample of a pure material decays from 600g to 75g in 42.9 days, what radioisotope could be in the sample?

6. Co-60 is used in some cancer radiation therapies. What percent of a sample of Co-60 will remain undecayed after 5.26 years? Co-60 half-life is 5.26 years

7. Sr-90 is a common waste product of nuclear fission reactors. How many half-lives of Sr-90 will pass after 140.5 years? Sr-90 half-life is 28.1 years

8. A wooden coffin was found that was estimated to be 22,920 years old. What percent C-14 was left in the wood?

9. How many years does it take for a 1200g sample of carbon-14 to decay to 37.5g?

**Half-life times**

5730 years – carbon-14 10.76 years – krypton-85

5.26 years – cobalt-60 28.1 years – strontium-90

30.23 years – cesium-137 8.07 days – iodine-131

27.5 secondsfrancium-220 14.3 days for Phosphorus-32

12.26 years – hydrogen-3