

Exponential Decay (Assignment 30)

1. The radioactive element chromium-51 has a half-life of 28 days. How much of a 17 gram sample of chromium-51 will remain after 100 days?
2. The radioactive element titanium-44 has a half-life of 63 years. How much of a 2.6 gram sample of titanium-44 will remain after two centuries?
3. The radioactive element thorium-229 has a half-life of 75 years. How much of a 0.02 gram sample of thorium-229 will remain after 90 years?
4. Every year the value of a stock in which you have invested decreases by 7%. How much of your original investment will be left after 5 years?
5. Due to an extensive effort from the professional medical community, the number of cases of swine flu in 2009 was cut by 60% each month in 2009. If there were 9,400 cases of swine flu at the start of February, 2009, how many cases still remained at the start of October, 2009?

Solve for the missing variable.

6. $A = \$5,223.40$

$P = ?$

$r = 5\%$ compounded quarterly

$t = 3$ years

7. $A = \$1,025.16$

$P = \$1,000$

$r = ?\%$ compounded semiannually

$t = 1$ year

The following is a list of several radioactive elements and their half-lives.

| Element | Half-life | Element | Half-life |
|---------------|--------------|---------------|------------------|
| titanium-44 | 63 years | carbon-10 | 21 hours |
| niobium-91 | 690 years | iodine-129 | 15,700,000 years |
| chromium-51 | 27.7 days | phosphorus-32 | 14 days |
| plutonium-242 | 72,300 years | iodine-131 | 8 days |
| strontium-90 | 29 years | thorium-229 | 75 years |

An archeologist has just dug up a collection of bones and brought them into your lab to be dated. Use the list of half-lives above to help you date each bone, then try to determine the most probable identity of the bone based on its age.

Bone #1: There are 0.2 grams of a 1.6 gram sample of plutonium-242 remaining.

Bone #2: There are 0.025 grams of a 0.1 gram sample of strontium-90 remaining.

Bone #3: There are 0.25 grams of a 64 gram sample of titanium-44 remaining.

Bone #4: There are 0.1875 grams of a 12 gram sample of carbon-10 remaining.

Bone #5: There are 0.14 grams of a 0.56 gram sample niobium-91 remaining.

Bone #6: There are 0.1375 grams of a 2.2 gram sample of iodine-129 remaining.

Bone #7: There are 0.025 grams of a 0.8 gram sample of thorium-229 remaining.

The bone belonged to:

Christopher Columbus

Tyrannosaurus

Last night's chicken wings

Socrates

Neanderthal

John. F. Kennedy

Albert Einstein

Muhammad

George Washington

Stegosaurus

Jesus Christ