

HALF-LIFE OF RADIOACTIVE ISOTOPES

Name _____

1. How much of a 100.0 g sample of ^{198}Au is left after 8.10 days if its half-life is 2.70 days?

2. A 50.0 g sample of ^{16}N decays to 12.5 g in 14.4 seconds. What is its half-life?

3. The half-life of ^{42}K is 12.4 hours. How much of a 750 g sample is left after 62.0 hours?

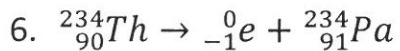
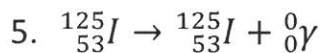
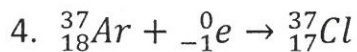
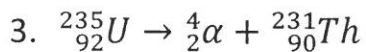
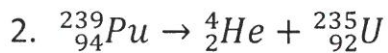
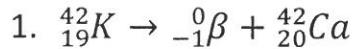
4. What is the half-life of ^{99}Tc if a 500 g sample decays to 62.5 g in 639,000 years?

5. The half-life of ^{232}Th is 1.4×10^{10} years. If there are 25.0 g of the sample left after 2.8×10^{10} years, how many grams were in the original sample?

6. There are 5.0 g of ^{131}I left after 40.35 days. How many grams were in the original sample if its half-life is 8.07 days?

Classifying Nuclear Reactions

Directions: Determine the following nuclear reactions as either alpha decay, beta decay, gamma, or electron capture.

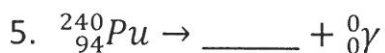
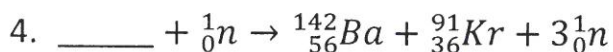
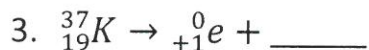
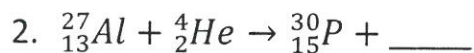


Directions: Complete the following nuclear equations so that they are balanced for both mass and nuclear charge, then determine the type of nuclear reaction as either alpha, beta, gamma, or electron emission.



Balancing Nuclear Reactions

Directions: Complete the following nuclear equations so that they are balanced for both mass and nuclear charge.



Directions: Write a balanced equation for each of the following nuclear changes. You must supply the missing product in each equation.

7. Uranium-238 emits an alpha particle.

8. Four hydrogen-1 nuclei combine and release two positrons (${}^0_{+1}\text{e}$).

9. The decay of ${}^{53}_{26}\text{Fe}$ by beta emission.

10. Write the balanced nuclear equation for the fusion reaction between a lead-208 nucleus and an iron-58 nucleus. One of the two products is a neutron.

Nuclear Chemistry Concepts

Directions: Match the following descriptions with the correct term.

- | | |
|---|-----------------------|
| ___ 1. A procedure that uses positrons to detect many different medical disorders | a. rad |
| ___ 2. A unit used to measure the amount of radiation absorbed by the body | b. CAT scans |
| ___ 3. The annual amount of radiation to which a person is normally exposed | c. Roentgen |
| ___ 4. A unit used to measure the amount of damage done to a body | d. radioactive dating |
| ___ 5. Used to approximate the age of an object using the half-life of radioactive isotopes | e. 100–300 mrem |
| ___ 6. Used in radiation therapy for cancer patients | f. rem |
| ___ 7. Used in smoke detectors | g. Cobalt-60 |
| ___ 8. Shows cross-sectional views of the body | h. Americium-241 |
| ___ 9. A unit used to express gamma radiation in the air | i. PET |

Directions: Determine if each item pertains to **alpha (α)**, **beta (β)**, or **gamma (γ)** radiation.

- _____ 1. Carries an electric charge of 0
- _____ 2. Heaviest of the three particles
- _____ 3. Electrons
- _____ 4. No mass
- _____ 5. Not blocked by lead or concrete
- _____ 6. Carries an electric charge of 2+
- _____ 7. Blocked by paper
- _____ 8. Blocked by metal foil
- _____ 9. Photons
- _____ 10. ${}^4_2\text{He}$

Directions: Determine if each item pertains to **fusion**, **fission**, or **both**.

- _____ 1. Breaking apart of a large nucleus
- _____ 2. Used in nuclear weapons
- _____ 3. Used in nuclear power plants
- _____ 4. Nuclei combine to form a larger stable nucleus
- _____ 5. Energy is released
- _____ 6. Doesn't produce radioactive waste
- _____ 7. Requires high pressure and temperature to occur