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 75$\bar{0}$ g sample is left after 62.0 hours?

_____

4. What is the half-life of ^{99}Tc if a 50$\bar{0}$ 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?

_____

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Classifying Nuclear Reactions

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

1. $^{42}_{19}K \rightarrow {}^{0}_{-1}\beta + {}^{42}_{20}Ca$ _____

2. $^{239}_{94}Pu \rightarrow {}^{4}_{2}He + {}^{235}_{92}U$ _____

3. $^{235}_{92}U \rightarrow {}^{4}_{2}\alpha + {}^{231}_{90}Th$ _____

4. $^{37}_{18}Ar + {}^{0}_{-1}e \rightarrow {}^{37}_{17}Cl$ _____

5. $^{125}_{53}I \rightarrow {}^{125}_{53}I + {}^{0}_{0}\gamma$ _____

6. $^{234}_{90}Th \rightarrow {}^{0}_{-1}e + {}^{234}_{91}Pa$ _____

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.**

7. $^{212}_{84}Po \rightarrow$ _____ $+ {}^{208}_{82}Pb$ _____

8. $^{239}_{93}Np \rightarrow$ _____ $+ {}^{235}_{91}Pa$ _____

9. $^{93}_{43}Tc \rightarrow$ _____ $+ {}^{93}_{43}Tc$ _____

10. $^{239}_{96}Cm +$ _____ $\rightarrow {}^{239}_{95}Am$ _____

Balancing Nuclear Reactions

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

1. $^{1}_{1}H + {}^{3}_{1}H \rightarrow$ _____

2. $^{27}_{13}Al + {}^{4}_{2}He \rightarrow {}^{30}_{15}P +$ _____

3. $^{37}_{19}K \rightarrow {}^{0}_{+1}e +$ _____

4. _____ $+ {}^{1}_{0}n \rightarrow {}^{142}_{56}Ba + {}^{91}_{36}Kr + 3{}^{1}_{0}n$

5. $^{240}_{94}Pu \rightarrow$ _____ $+ {}^{0}_{0}\gamma$

6. $^{51}_{24}Cr +$ _____ $\rightarrow {}^{51}_{23}V$

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 $({}^{0}_{+1}e)$.

9. The decay of $^{53}_{26}Fe$ 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
____2. A unit used to measure the amount of radiation absorbed by the body
____3. The annual amount of radiation to which a person is normally exposed
____4. A unit used to measure the amount of damage done to a body
____5. Used to approximate the age of an object using the half-life of radioactive isotopes
____6. Used in radiation therapy for cancer patients
____7. Used in smoke detectors
____8. Shows cross-sectional views of the body
____9. A unit used to express gamma radiation in the air

a. rad
b. CAT scans
c. Roentgen
d. radioactive dating
e. 100–300 mrem
f. rem
g. Cobalt-60
h. Americium-241
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. $^{4}_{2}He$

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