**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period\_\_\_\_\_**

**Positron Emission & Electron Capture**

Identify the following reactions as positron emission or electron capture

**1.** $ + \rightarrow $ **2.** $ + \rightarrow $ **3.** $ \rightarrow $

**Balancing Decay Reactions**

Fill in the blanks and identify which type of decay each reaction is. (alpha, beta, gamma, electron capture or positron emission)

**4.**  $ \rightarrow \\_\\_\\_\\_\\_\\_+$ **7**. $ \rightarrow \\_\\_\\_\\_\\_\\_+$

**5.** $ + \\_\\_\\_\\_\\_\\_\rightarrow $ **8.** $ \rightarrow \\_\\_\\_\\_\\_\\_+$

**6.** $ \rightarrow \\_\\_\\_\\_\\_\\_+$ **9.**$ \rightarrow \\_\\_\\_\\_\\_\\_+$

**Half-lives**

1. If gallium-68 has a half-life of 68.3 minutes, how much of a 10.0 mg sample is left after…
	1. 1 half-life?
	2. 2 half-lives?
	3. 3 half-lives?
2. If the passing of five half-lives leaves 43.3 mg of a strontium-90 sample, how much was present in the beginning?
3. The initial mass of a radioisotope is 11.7 g. If the radioisotope has a half-life of 2.75 years, how much remains after four half-lives?
4. The half-life of tritium (31H) is 12.3 years. If 45.0 mg of tritium is released from a nuclear power plant during the course of a mishap, what mass of the nuclide will remain after…
	1. 24.6 years?
	2. 98.4 years?
5. Technetium-104 has a half-life of 18.0 minutes. How much of a 165.0 g sample remains after 54.0 minutes?
6. Manganese-56 decays by beta emission and has a half-life of 2.6 hours.
	1. How many half-lives are there in 22 hours?
	2. How many mg of a 50.0 mg sample will remain after five half-lives?

**Neutron-to-proton ratios**

1. Calculate the neutron-to-proton ratio for each of the following atoms.
	1. Tin-134
	2. Silver-107
	3. Carbon-12
	4. Nickel-63
	5. Carbon-14
	6. Iron-61
	7. Calcium-39

**Half-lives KEY**

1. If gallium-68 has a half-life of 68.3 minutes, how much of a 10.0 mg sample is left after…
	1. 1 half-life? **5 mg**
	2. 2 half-lives? **2.5 mg**
	3. 3 half-lives? **1.25 mg**
2. If the passing of five half-lives leaves 43.3 mg of a strontium-90 sample, how much was present in the beginning? **1390 mg**
3. The initial mass of a radioisotope is 11.7 g. If the radioisotope has a half-life of 2.75 years, how much remains after four half-lives? **0.731 g**
4. The half-life of tritium (31H) is 12.3 years. If 45.0 mg of tritium is released from a nuclear power plant during the course of a mishap, what mass of the nuclide will remain after…
	1. 24.6 years? **11.2 mg**
	2. 98.4 years? **0.176 mg**
5. Technetium-104 has a half-life of 18.0 minutes. How much of a 165.0 g sample remains after 54.0 minutes? **20.6 g**
6. Manganese-56 decays by beta emission and has a half-life of 2.6 hours.
	1. How many half-lives are there in 22 hours? **8.46 half-lives**
	2. How many mg of a 50.0 mg sample will remain after five half-lives? **1.56 mg**

**Neutron-to-proton ratios**

1. Calculate the neutron-to-proton ratio for each of the following atoms.
	1. Tin-134 **1.68 neutrons/protons**
	2. Silver-107 **1.28 neutrons/protons**
	3. Carbon-12 **1 neutrons/protons not radioactive**
	4. Nickel-63 **1.25 neutrons/protons**
	5. Carbon-14 **1.33 neutrons/protons**
	6. Iron-61 **1.35 neutrons/protons**
	7. Calcium-39 **.95 neutrons/protons**