1. These two radioactive elements that are alpha particle (*α*) emitters. Write the nuclear reactions for each decay including the formation of the daughter products:
	1. $ $ →
	2. $ $ →
2. These two radioactive elements that are beta particle (*β*–) emitters. Write the nuclear reactions for each decay including the formation of the daughter products:
	1. $ $ →
	2. $ $ →
3. These two radioactive elements that are positron (*β*+) emitters. Write the nuclear reactions for each decay including the formation of the daughter products:
	1. $ $ →
	2. $ $ →
4. These two radioactive elements decay by electron capture (*EC*). Write the nuclear reactions for each decay including the formation of the daughter products:
	1. $ $ + $ $ →
	2. $ $ + $ $ →
5. Balance each nuclear decay equation by filling in the blanks. Classify each nuclear decay as alpha (α), beta (β−), positron (β+), or electron capture (EC):
	1. →  +  Type of decay:
	2.  +  → \_\_\_\_\_\_\_ Type of decay:
	3. $$ →  \_\_\_\_\_\_\_ Type of decay:
	4. $$ →  + $$ Type of decay:
	5. +  →  Type of decay:
	6.  →  + \_\_\_\_\_\_\_ Type of decay:
	7.  → \_\_\_\_\_\_\_ +  Type of decay:
	8. $$ → $$ + \_\_\_\_\_\_\_ Type of decay:



Show all work; observe all significant figures, and record units with all answers.

1. Americium-247 undergoes beta decay to curium-247 with a half-life of 23 minutes.
	1. Write the complete nuclear decay reaction for this process, using full symbols for all isotopes and particles.
	2. How many half-lives will it take for 75% of a 350 gram sample of americium-247 to decay to curium-247?
	3. If one starts with a 1000 g sample of americium-247, what mass of americium-247 will remain after 92 minutes?
2. The half life of cobalt-60 is 5.3 years. How much of a 1.000 mg sample of cobalt-60 is left after a 2.15 year period?
3. The half-life of tritium (hydrogen-3) is 12.3 years. If 48.0 mg of tritium is released from a nuclear power plant during the course of an accident, what mass of this nuclide will remain after 12.3 years? After 74.2 years?
4. The half life of Plutonium- 239 is 24,000 years. What fraction of the Plutonium-239 present in nuclear wastes generated today will be present in the year 3000?