

Nuclear Chemistry; SC1a, SC3d

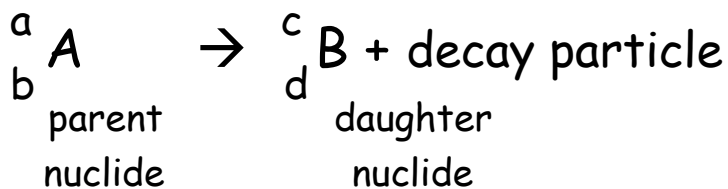


- Reactions that involve a change in an atom's nucleus:
Nuclear Reactions
- Radioactivity is when a substance spontaneously emits radiation
- The particles that are released are called radiation.
- Why does radiation occur?
 - When a nucleus is unstable, it has to regain stability, so it releases energy in the form of radiation.
- All elements above 83 are radioactive

Types of Radioactive Particles

Type	Symbol	Power	Shielding
alpha (+ charge)	α , ${}^4_2\alpha$ ${}^4_2\text{He}$	low	Paper & clothing
beta (- charge)	β , ${}^0_{-1}\beta$ ${}^0_{-1}\text{e}$	medium	Metal foil
positron (+ charge)	β^+ , e^+	medium	Metal foil
gamma (neutral)	γ , ${}^0_0\gamma$	high	Lead & concrete

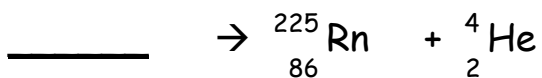
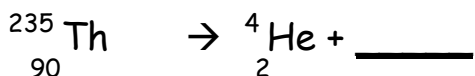
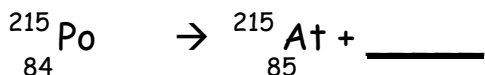
- Nuclear Equations:



The atomic # & mass # must be conserved!

...numbers on the left must balance those on the right

- Practice Problems



- U-238 undergoes alpha decay. Write the nuclear equation.
- U-238 undergoes beta decay. Write the nuclear equation.
- U-238 undergoes gamma & beta decay. Write the nuclear equation.

Radioactive Half Life

- Radioactive Decay rates are measured in half lives
- Half-life: time for $\frac{1}{2}$ of the nuclei to decay to products
 - Used for radioactive dating
 - Medical procedures (diagnose & treat disease), trace particle through system (DNA, fertilizers)
- Half-life can be expressed mathematically as:

$$\text{Amount remaining} = (\text{initial amount})\left(\frac{1}{2}\right)^n$$

n = the number of half-lives