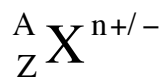


CH 222 "q&d" Guide to Nuclear Chemistry

"q&d" = "Quick 'n' Dirty"



X = element symbol

n = element charge (if any)

Z = atomic number (number of protons)

A = mass number (number of protons + neutrons)

Types of Radiative Processes

Alpha Decay:	Lose ${}^4_2\text{He}$	<i>Example:</i>	${}^{234}_{92}\text{U} \rightarrow {}^4_2\text{He} + {}^{230}_{90}\text{Th}$	<i>Note 1</i>
Beta Decay:	Lose ${}^0_{-1}\text{e}$	<i>Example:</i>	${}^{235}_{92}\text{U} \rightarrow {}^0_{-1}\text{e} + {}^{235}_{93}\text{Np}$	<i>Note 4</i>
Gamma Decay:	Emit Energy	<i>Example:</i>	${}^{99m}_{43}\text{Tc} \rightarrow \gamma + {}^{99}_{43}\text{Tc}$	<i>Note 2</i>
Positron Emission:	Lose ${}^0_{+1}\text{e}$	<i>Example:</i>	${}^{207}_{84}\text{Po} \rightarrow {}^0_{+1}\text{e} + {}^{207}_{83}\text{Bi}$	<i>Notes 3, 4</i>
Electron Capture:	Gain ${}^0_{-1}\text{e}$	<i>Example:</i>	${}^7_4\text{Be} + {}^0_{-1}\text{e} \rightarrow {}^7_3\text{Li}$	<i>Note 4</i>
Neutron Capture:	Gain ${}^1_0\text{n}$	<i>Example:</i>	${}^6_3\text{Li} + {}^1_0\text{n} \rightarrow {}^4_2\text{He} + {}^3_1\text{H}$	

Note 1: The alpha particle is actually charged, having a charge of +2. This makes the other product have a negative -2 charge (conservation of charge), but the charges of the ions are rarely considered in nuclear chemistry.

Note 2: Gamma emissions have energies in the range of roughly 1 MeV (1.6×10^{-13} J).

Note 3: A positron is an *antielectron* (a particle of antimatter) - when a positron and an electron collide, they annihilate each other (${}^0_{+1}\text{e} + {}^0_{-1}\text{e} \rightarrow 2\gamma$).

Note 4: The beta decay process produces an antineutrino in addition to the other products, while the positron emission and electron capture processes result in the creation of a neutrino. This is due to the conservation of spin concept, but you need not concern yourself about neutrinos in *this* CH 222 class!