Types of Radioactive Decay

type	example	notes
alpha (α) decay	$^{238}_{92}\mathrm{U} \rightarrow {}^{4}_{2}\mathrm{He} + {}^{234}_{90}\mathrm{Th} + 2\,{}^{0}_{0}\gamma$	● α particle = $^{4}_{2}\mathrm{He}$ nucleus (i.e., $^{4}_{2}\mathrm{He}^{2+}$)
beta (β^-) decay	$^{234}_{90}\mathrm{Th} \rightarrow {}^{0}_{-1}e + {}^{234}_{91}\mathrm{Pa}$	● β^- particle = $^{0}_{-1}e$ (an electron) ● energy released in decay process *creates* the β^- particle (not from an orbital) ● net effect: convert neutron to proton ● β^- particles likely to be produced by nuclides with *high* neutron-to-proton ratios
positron (β^+) decay	$^{38}_{19}\mathrm{K} \rightarrow {}^{0}_{1}e + {}^{38}_{18}\mathrm{Ar}$	● β^+ particle = $^{0}_{1}e$ (a positive electron) ● net effect: convert proton to neutron ● β^+ particles likely to be produced by nuclides with *low* neutron-to-proton ratios ● β^+ is "antiparticle" of β^-
electron capture	$^{195}_{80}\mathrm{Hg} + {}^{0}_{-1}e \rightarrow {}^{195}_{79}\mathrm{Au}$	● an inner-orbital electron captured by nucleus ● generally slow
gamma (γ) decay	$^{60}_{27}\mathrm{Co} \rightarrow {}^{60}_{28}\mathrm{Ni} + {}^{0}_{-1}e + 2\,{}^{0}_{0}\gamma$	● $^{0}_{0}\gamma$ = high energy photon ● frequently accompanies other decay types ● a way of "draining off" excess energy (product nuclide may be in excited state)
spontaneous fission	$^{252}_{98}\mathrm{Cf} \rightarrow {}^{140}_{54}\mathrm{Xe} + {}^{108}_{44}\mathrm{Ru} + 4\,{}^{1}_{0}\mathrm{n}$	● generally slow ● "splitting" of heavy nuclide to lighter ones with similar mass numbers