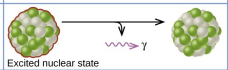
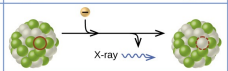
Nuclear Decay Processes

Type	Nuclear equation	Representation	Change in mass/atomic numbers
Alpha decay	${}^{A}_{Z}X \rightarrow {}^{4}_{2}He + {}^{A-4}_{Z-2}Y$		A: decrease by 4 Z: decrease by 2
Beta decay	${}^{A}_{Z}X \rightarrow {}^{0}_{-1}e + {}^{A}_{Z+1}Y$		A: unchanged Z: increase by 1
Gamma decay	${}^{A}_{Z}X \rightarrow {}^{0}_{0}\gamma + {}^{A}_{Z}Y$		A: unchanged Z: unchanged
Positron emission	${}^{A}_{Z}X \rightarrow {}^{0}_{+1}e + {}^{A}_{Y-1}Y$		A: unchanged Z: decrease by 1
Electron capture	${}^{A}_{Z}X + {}^{0}_{-1}e \rightarrow {}^{A}_{Y-1}Y$		A: unchanged Z: decrease by 1

Additional Decay Processes

In addition to Alpha and Beta decay additional decay processes can occur including **gamma radiation**, **positron emission**, and **electron capture**

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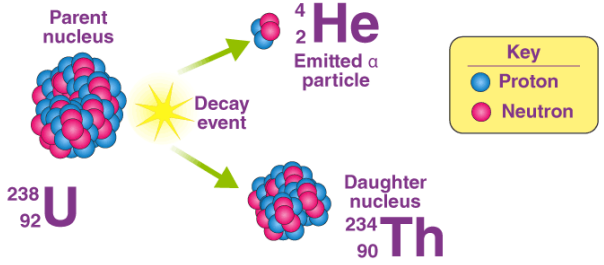
Alpha Nuclear Decay

Breakdown of a large unstable atomic isotope by removing 2 protons and 2 neutrons ($2p^+ + 2n^o$) producing an alpha particle and a smaller isotope



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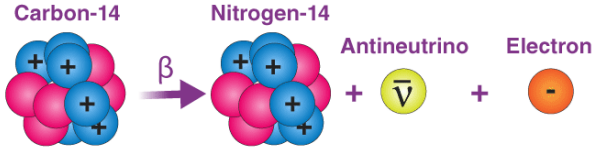
Beta (-) Nuclear Decay

An atom with too many neutrons (n^o) will transmute the extra neutron into a proton (p^+) and an electron (e^-) along with an antineutrino.



Beta-minus Decay

Carbon-14 is an important isotope that is used for radioactive dating of older carbon samples. (*The ratio of C-12 and C-14 gives the approx. age*)

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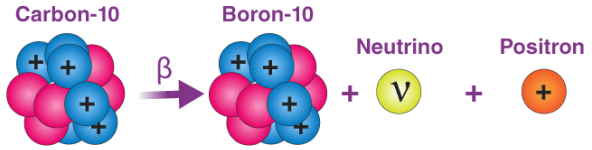
Beta (+) Nuclear Decay

An atom with too few neutrons (n^o) will transmute the extra proton into a neutron (n^o) and a positron (e^+) (+ electron) and a neutrino.



Beta-plus Decay

Unstable Carbon-10 has too new neutrons ($4n^o$) and decays into the larger Boron-10 isotope which is the main stable isotope.

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