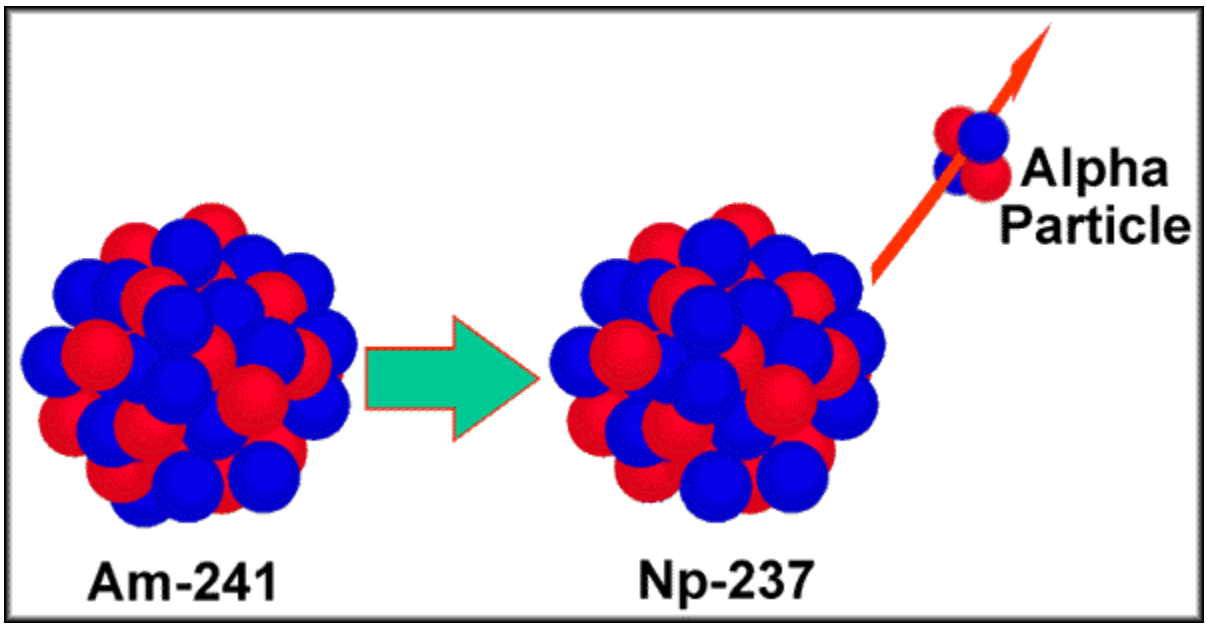
Three Types of Radioactive Decay

There are three main types of radiation:

- Alpha radiation
- Beta radiation
- Gamma radiation

Alpha Decay

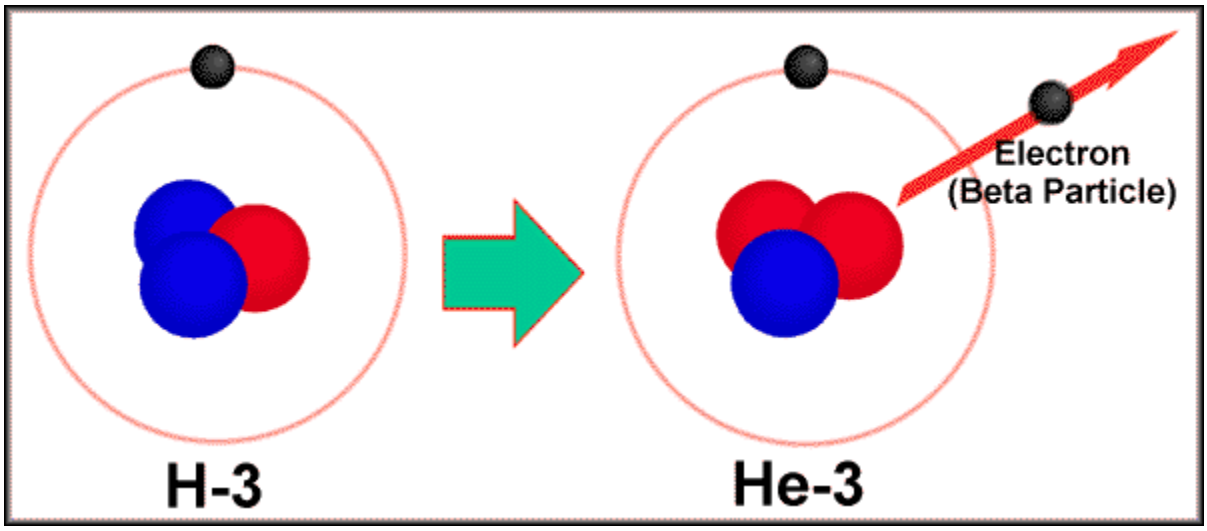
The reason alpha decay occurs is because the nucleus has too many protons which cause excessive repulsion. In an attempt to reduce the repulsion, a Helium nucleus is emitted. The way it works is that the Helium nuclei are in constant collision with the walls of the nucleus and because of its energy and mass, there exists a nonzero probability of transmission. That is, an alpha particle (Helium nucleus) will tunnel out of the nucleus. Here is an example of alpha emission with americium-241:



Alpha Decay of Americium-241 to Neptunium-237

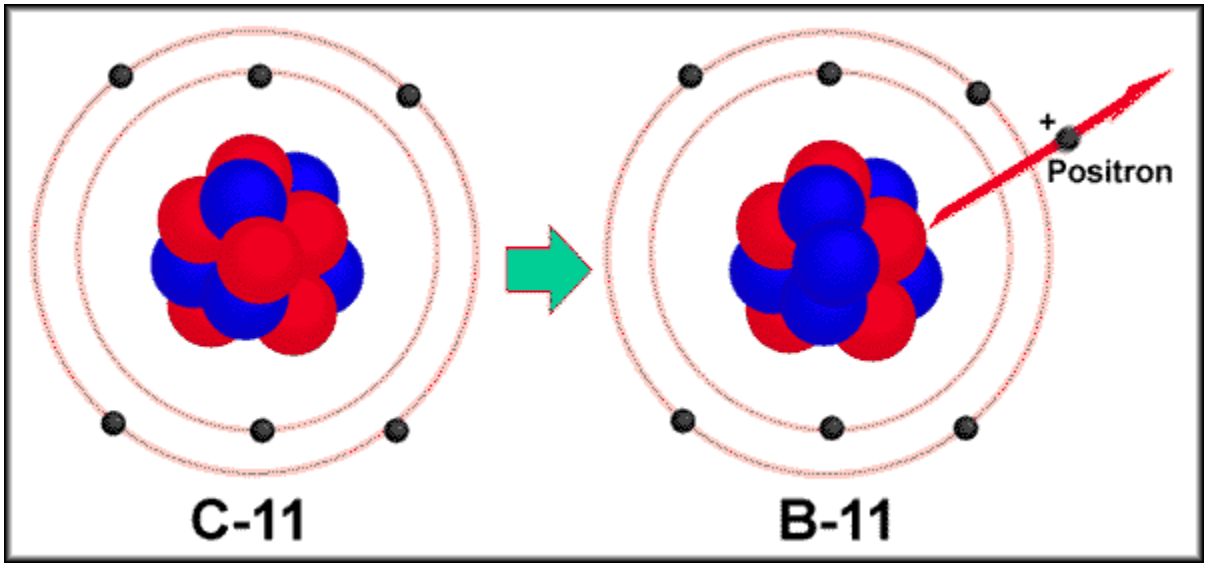
Beta Decay

Beta decay occurs when the neutron to proton ratio is too great in the nucleus and causes instability. In basic beta decay, a neutron is turned into a proton and an electron. The electron is then emitted. Here's a diagram of beta decay with hydrogen-3:



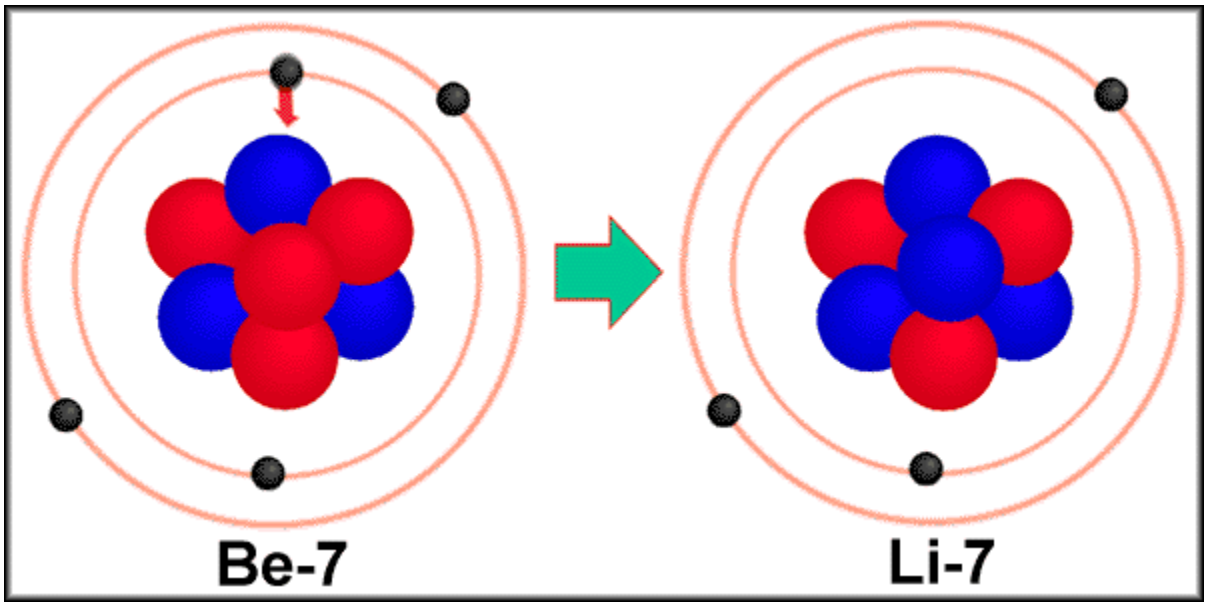
Alpha Decay of Hydrogen-3 to Helium-3

There is also **positron emission** when the neutron to proton ratio is too small. A proton turns into a neutron and a positron and the postiron is emitted. A positron is basically a positively charged electron. Here's a diagram of positron emission with carbon-11:



Positron Decay of Carbon-11 to Boron-11

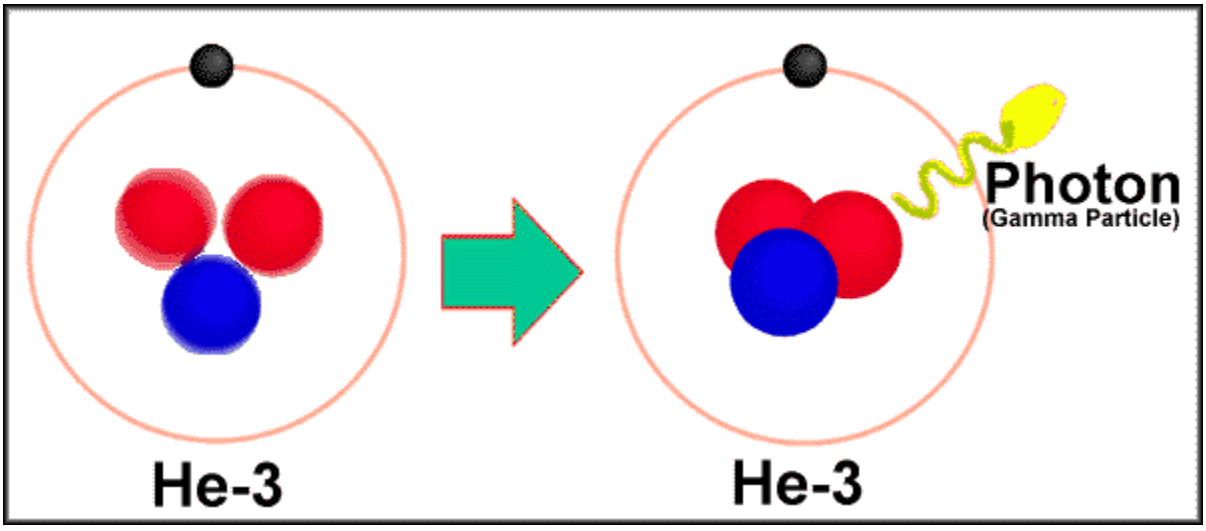
The final type of beta decay is known as **electron capture** and also occurs when the neutron to proton ratio in the nucleus is too small. The nucleus captures an electron which basically turns a proton into a neutron. Here's a diagram of electron capture with beryllium-7:



Electron Capture of Beryllium-7

Gamma Decay

Gamma decay occurs because the nucleus is at too high an energy. The nucleus falls down to a lower energy state and, in the process, emits a high energy photon known as a gamma particle. Here's a diagram of gamma decay with helium-3:



Gamma Decay of Helium-3