Nuclear Decay

1. What is nuclear decay?

   A decay in which an unstable nucleus transforms into a stable nucleus through a series of "decays". A decays is the loss of various components from the nucleus including alpha and beta particles, gamma rays, positrons, etc.

2. What determines the stability of a nucleus?

   The ratio of protons to neutrons in the nucleus determines the nucleus stability.

3. What is one purpose that the neutrons serve in the nucleus?

   They separate the positively charged protons from one another – thereby minimizing the repulsions felt within the nucleus.

4. What are some methods of decay?

   a. α particle decay.

      An alpha particle is equivalent to a Helium atom.

      $${}^{4}_{2}\mathrm{He}$$

   b. β particle decay.

      A beta particle is equivalent to an electron.

      $${}^{0}_{-1}\mathrm{e}$$

   c. Positron emission

      Is basically, a positively charged electron (anti-matter).

$^{0}_{+1}e$

d. Gamma ray emission.

   High energy that is released in some decays.

$^{0}_{0}\gamma$

e. Electron capture.

   This occurs in heavy elements. These elements have a nucleus full of positively charged protons, because of this, the core electrons are highly attracted to (and therefore very close to the nucleus). Because of the very tight proximity electrons may "fall" into the nucleus. In *very* simplified terms, the electron that was "captured" and a proton in the nucleus, convert into a neutron.