Chem 116: Lecture 15 Notes
10/23/08
[HT]

Exam 2 will cover Chapters 13, 14, and parts of 21.

Chapter 21: Nuclear Chemistry

- Chemical bonding studies the activities of the valence electrons in atoms.

- Nuclear chemistry examines the activities in the nucleus, the location of the neutrons and protons. Protons are positive and same charged particles repel, however the "strong force" of the neutrons overcomes this repelling action of the protons.
- As understood from earlier lectures, an element is determined by the number of protons it has. Same elements with different numbers of neutrons are called **isotopes.**
- Different isotopes have different natural abundances.
- **Different isotopes = different abundances = different ratio of neutron: proton = different levels of stability = different tendency to be radioactive.**
- Refer to page 4. The graph shows the 1:1 neutron: proton ratio line, which shows the most stable isotopes.
- When the term "splitting an atom" is used, the reference is to the splitting of the nucleus which releases energy while mass is lost since the majority of the mass in an atom is in the nucleus. (The electrons are distributed with the smaller atoms as the larger nucleus splits apart.)

Page 3 in Lecture 15 has examples of nuclear processes that will be on Exam 2:
- Alpha decay
- Beta decay
- Positrons
- Gamma decay

To determine an unknown product isotope, product radiation, or radioactive starting isotope, balance the mass number (top number) and protons (bottom number).

Example Alpha decay: Alpha particle (α)
Step 1: 226 Neutron (Ra) - 222 Neutron (Rn) = 4 Neutron
Step 2: 88 Proton (Ra) - 86 (Rn) = 2 Proton
Step 3: 2 Proton is the element He.

Example Beta decay: Beta particle (β)
Step 1: 131 Neutron (I) – 131 Neutron (Xe) = 0 Neutron
Step 2: 53 Proton (I) – 54 Proton (Xe) = -1 Proton
Step 3: Do not forget the negative sign as +1 Proton is the Positron (antielectron).

Gamma decay is very dangerous and is 0/0 Neutron: Proton ratio (γ). Has no mass.
End Exam 2 Material