Chemistry 105
Homework Set # 2 (25 points)
Due Saturday, October 2

This lab may be turned in and considered on-time through Monday, October 4th to accommodate those who might have many questions at the lab meeting and need a few extra days.

These questions are based on material in chapter 3 (sections 3.5-3.8) and chapter 4 (sections 4.1-4.5).

Atomic Mass

Example: Thallium has two naturally occurring isotopes, Tl-203 and Tl-205. Tl-203 has a mass of 202.97 amu and makes up 29.52% of naturally occuring thallium. Tl-205 has a mass of 204.97 amu and makes up the other 70.48%. What is thalliums average atomic mass?

$$Avg.\ Atomic\ Mass = (202.97\ amu)(0.2952) + (204.97\ amu)(0.7048) = 204.38\ amu$$

The atomic mass of each isotope is multiplied by the naturally occurring percent abundance of that isotope (in decimal form) and these are added together. This result is a weighted average for the mass of this element. A simple average is inappropriate because there is more Tl-205 than Tl-203.

1. Rhenium has two naturally occurring isotopes, Re-185 and Re-187. Re-185 has a mass of 184.95 amu and makes up 37.40% of naturally occuring rhenium. Re-187 has a mass of 186.96 amu and makes up the other 62.60%. What is the average atomic mass for rhenium? Show all your work.

2. Indium has two naturally occurring isotopes, In-113 and In-115. The average atomic mass of indium is 114.82 amu. Given this information, which one of the following is the closest to the actual abundances of the two isotopes? (multiple choice, choose 1)

   (a) 5% In-113 and 95% In-115
   (b) 30% In-113 and 70% In-115
   (c) 50% In-113 and 50% In-115
   (d) 95% In-113 and 5% In-115

Electron Configuration

3. Without referring to a periodic table, give the atomic numbers of the elements with the following electron configurations. (These are CfCT problems 3.19 and 3.20, page 86.)

   - $1s^2 2s^2 2p^2$
   - $1s^2 2s^2 2p^5$
   - $1s^2 2s^2 2p^6 3s^2 3p^4$
   - $1s^2 2s^2 2p^6 3s^2 3p^1$
   - $1s^2 2s^2 2p^6 3s^1$
   - $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2$

4. Write out the full electron configurations of atoms of the following elements: *(See CfCT, Section 3.7)*
   example: Si: $1s^2\,2s^2\,2p^6\,3s^2\,3p^2$

   (a) Ca

   (b) Ar

   (c) N

   (d) Rb

   (e) Ti

   (f) Se

   (g) Mg

   (h) Al

5. Write out the electron configurations of atoms of the following elements using the noble gas notation: (See Notes for Discussion 4)
   example: Si: $[Ne]3s^2\,3p^2$

   (a) Ca

   (b) Rb

   (c) Ti

   (d) Se

   (e) Mg

   (f) Al

6. Indicate the number of: *(See CfCT section 3.7 and Discussion 4 notes.)*

   (a) subshells in energy shell 3

   (b) maximum electrons in energy shell 3

   (c) maximum electrons in the 2p subshell

   (d) maximum electrons in the 3d subshell

   (e) maximum electrons in <u>one</u> 3p orbital

   (f) orbitals in the 5p subshell

   (g) orbitals in the 3s subshell

Valence Electrons

6. Indicate the number of valence electrons in each of the following atoms: *(See Sections 3.8 and 4.1 in the CfCT text.)*

   (a) P

   (b) Br

   (c) Se

   (d) Sr

   (e) Cs

   (f) Kr

   (g) B

   (h) C

Ions

7. Identify the ion formed by each of the following elements to acquire a noble gas electron configuration. Also indicate whether electrons are gained or lost, and how many are gained or lost. Please follow the example below for lithium. *(See CfCT, Chapter 4, Sections 4.1-4.5)*

   example: Li $\longrightarrow$ *- forms* Li^+ *by losing 1* e^-

   (a) O

   (b) Ca

   (c) Se

   (d) P

   (e) Al

   (f) Cs

   (g) F

   (h) Sr

   (i) K