Chemistry 1100 – Worksheet for quiz 3

Atomic Structure, Molecular and Ionic Compounds

I. *Mass Number and Atomic Number*

mass number → 202
atomic number → 80 **Hg**

Atomic number = number of protons
(Atomic # identifies the element as much as the element symbol does.)
Mass number = number of protons + number of neutrons
(Mass # can only be given for a *specific* isotope of an element.)
If the atom is neutral (charge = 0), # protons = # electrons.
(proton = (+), electron = (-), neutron = no charge)

II. *Atomic Mass*

- The average mass number of an element accounting for isotopic natural abundance percentages.
- Atomic mass is the number given in the periodic table.
- Atomic mass of an element = molar mass = g/mole for that element.

III. *Molecular and Ionic Compounds – Naming (IUPAC)*

- The first step is to determine if the compound is molecular or ionic.
- For naming simple binary <u>molecular</u> compounds (two nonmetals)
  a. Give the element with the lower group # first.
  b. The name of the element of higher group # is changed to end in "ide".
  c. Use numerical prefixes as neccessary.
  d. <u>Do not use</u> numerical prefixes for H + chalcogens/halogens.

  examples: N_2O_5 = dintrogen pentoxide
  H_2S = hydrogen sulfide, <u>not</u> dihydrogen monosulfide
  H_2O = water or hydrogen oxide, <u>not</u> dihydrogen monoxide

- For naming <u>ionic</u> compounds (metal + nonmetal)
  a. Give the element name of the cation (+) first.
  b. Give the name of the anion (-) second, change to end in "ide".
  c. If compound is composed of a polyatomic ion, use the name of the ion. (Table 2.3 in textbook)
  d. For transition metal cations, specify ionic charge with roman numerals.
  e. Numerical prefixes are <u>not used</u> for ionic compounds.

  examples: Al_2O_3 = aluminum oxide
  $Mg_3(PO_4)_2$ = magnesium phosphate
  Cu_2SO_4 = copper(I) sulfate (because Cu^{+1})
  $CuSO_4$ = copper(II) sulfate (because Cu^{+2})

IV. *Molecular and Ionic Compounds – Predicting Formulas*

- To predict the formula for a compound (ionic or molecular)
  a. Determine the likely oxidation state (charge) for each elemental "ion" or for polyatomic ion.
  b. Determine the least common multiple needed to give an overall neutral charge for the compound.
  example: beryllium + iodine → BeI_2 = beryllium iodide
  (Be^{2+}) (I^-)

1. Match the scientist with his famous experiment/apparatus, and the discovery they made with it. (One scientist does not have a "famous" experiment.)

Scientist	Experiment/Apparatus	Discovery
James Chadwick	Au foil	electron
Robert Millikan	cathode ray tube	charge of the electron
J.J. Thomson	oil drop experiment	structure of the nucleus
Ernest Rutherford		neutron

a) _____ used the _____ to discover the _____.

b) _____ used the _____ to discover the _____.

c) _____ used the _____ to discover the _____.

d) _____ discovered the _____.

2. Give the atomic number, atomic mass and the number of protons, neutrons and electrons for each isotope.

a) ^{235}U atomic number_____ mass number_____

protons_____ neutrons_____ electrons_____

b) ^{184}W atomic number_____ mass number_____

protons_____ neutrons_____ electrons_____

3. What is the atomic mass (molar mass) of copper, if ^{63}Cu = 69.17% and ^{65}Cu = 30.83% natural abundance? (Assume ^{63}Cu = 63.00 g/mol, ^{65}Cu = 65.00 g/mol)

4. Bromine has two stable isotopes (^{79}Br and ^{81}Br). If the atomic mass of Br is 79.904 g/mol, what is the percent abundance of ^{79}Br and ^{81}Br?
(Assume atomic mass of ^{79}Br =79.00 g/mol and ^{81}Br = 81.00 g/mol.)

5. Give the IUPAC name of the following compounds.

a) H_2Te _____

b) $ZnCl_2$ _____

c) $Ba(NO_3)_2$ _____

d) Fe_2O_3 _____

e) CO _____

6. Give the simplest formula and the IUPAC name of the compound for each compound.

	I^-	CN^-	PO_4^{3-}	HCO_3^-	OH^-	SO_4^{2-}	NO_3^-
Co^{3+}							
Co^{2+}							
Na							
Mn^{6+}							
Al							
Sn^{4+}							
NH_4^+							
Fe^{3+}							