CHM 1045 (11:15 am Lecture)   **HOUR TEST 1**   **Name** _____
Dr. Light   **February 2, 2004**   **(please print)**

This exam consists of 4 pages. Make sure you have one of each. Print your name at the top of <u>each page</u> now. A fifth page contains a periodic chart. You may tear it off and use it as a scratch sheet. Show your work on calculations, including unit conversions, and give answers in the correct units and appropriate number of significant figures.
In problems involving molecular and formula weights, you may use values rounded to the nearest 0.1 amu.
If anything confuses you or is not clear, raise your hand and ask!

Page	Points
1	_____
2	_____
3	_____
4	_____
Total	_____

(6)   1.   An empty vial weighs 26.75 g. When filled with mercury (density = 13.53 g/cm^3), it weighs 251.63 g.
(a) What is its volume?

(b) How many **atoms** of mercury are in the vial?

(8)   3.   Name the following compounds:

Mg(CN)$_2$ _____   SeO$_3$ _____

Li$_3$PO$_3$ _____   CuBr$_2$ _____

(8)   4.   Write the formulas for the following:

diphosphorus trioxide _____   hexane   _____

copper (I) sulfide _____   aluminum chloride _____

(9)   5.   Give the number of protons, neutrons, and electrons in the following:

Nuclide	Protons	Neutrons	Electrons
^{103}Rh	_____	_____	_____
^{15}N^{-3}	_____	_____	_____
^{52}Cr^{+3}	_____	_____	_____

(4)   6.   For each of the following pairs of quantities, **circle** the larger quantity of the pair:

(a) the greater distance: (c) the greater volume
    10 miles or 12 kilometers   5 liters or 7 quarts
(b) the greater mass: (d) the higher temperature
    2 pounds or 3 kilograms   50 $^\circ$F or 20 $^\circ$C

(8)   7.   Give the atomic symbol, as in the illustration, including **Z**, **A**, and **q** for atoms or ions containing the following numbers of particle s:

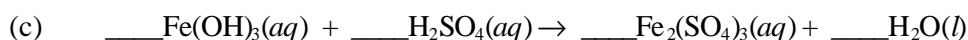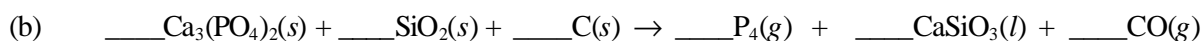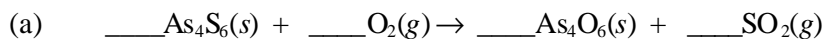(a) 16 p, 16 n, 18 e   (b) 29 p, 35 n, 28 e

$$_Z^A X^q$$
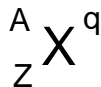
(6)   8.   Identify the individual associated with each of the following contributions to our understanding of atomic structure by placing the letter by his name in the blank to the left of the contribution.

_____(a) He determined the fundamental unit of charge (the   A. John Dalton
    charge on the electron) as 1.60×10^{-19} Coulombs.   B. Joseph John Thomson
_____(b) His experiments with alpha particles established that   C. Robert Millikan
    the mass of the atom is concentrated in a tiny nucleus.   D. Ernest Rutherford
_____(c) He determined the charge to mass ratio of the electron.   E. Dmitri Mendeleev
                                                                      F. Amedeo Avogadro
                                                                      G. Martin Silberberg

(6)   9.   Identify the **group** or **family** to which each of the following elements belongs by placing the letter corresponding to the group in the blank to the left of the element.

_____(a) argon   A. Alkali Metal
                            B. Alkaline Earth Metal
_____(b) arsenic   C. Transition Metal
_____(c) cobalt   D. Halogen
                            E. Noble Gas
_____(d) copper   F. Metalloid
_____(e) bromine
_____(f) beryllium

(12)   10.   Balance the following chemical equations (reduce to the smallest whole number coefficients; if coefficient is 1, you need not enter anything):

(a)   ____$As_4S_6(s)$ +   ____$O_2(g) \rightarrow$ ____$As_4O_6(s)$ +   ____$SO_2(g)$

(b)   ____$Ca_3(PO_4)_2(s)$ +   ____$SiO_2(s)$ +   ____$C(s) \rightarrow$ ____$P_4(g)$ +   ____$CaSiO_3(l)$ +   ____$CO(g)$

(c)   ____$Fe(OH)_3(aq)$ +   ____$H_2SO_4(aq) \rightarrow$ ____$Fe_2(SO_4)_3(aq)$ +   ____$H_2O(l)$

(d)   ____$KNO_3(s) \rightarrow$ ____$K_2O(s)$ +   ____$N_2(g)$ +   ____$O_2(g)$

(4)   11.   Chlorophyll, the green pigment of plants, has a molecular formula of $C_{55}H_{72}MgN_4O_5$.
                What is the percent composition of magnesium in chlorophyll? .

(8)   12.   A compound was shown by analysis to consist of 29.3% C, 3.7% H, 39.0% O and 28.0% Na.
                What is the empirical formula of this compound?

(6)   13.   You place 9.27 g of KOH into a 250 mL volumetric flask, and fill the flask with water.

                (a) What is the M (i.e., molarity) of the KOH solution?

                (b) You need 0.0200 moles of KOH for a reaction. What volume of this solution would you
                     measure?

(15)   14.   Aluminum combines with molecular Sulfur (S_8) to form Aluminum Sulfide according to the equation:

$$16 \; Al \; + \; 3 \; S_8 \; \rightarrow \; 8 \; Al_2S_3$$

25.0 g of aluminum and 25.0 g of sulfur are mixed and heated until the reaction is complete. Answer each of the following questions in the blank provided **showing your work in the space under the question.**

(a)   How many moles of Al is this?   _____

(b)   How many moles of S_8 molecules is this? _____

(c)   Which is the limiting reactant?   _____

(d)   How many g of Al_2S_3 will be produced?   _____

(e)   How many g of the excess reactant will be left? _____