P E1 (pg 1 of 3) **Wholey (Holy) Moley!!** Name_____

1. Given a 5.0 g silver ring. $_{47}Ag$
   a. How many moles of silver?
   b. How many atoms of silver?

2. Stannous fluoride, also named tin(II) fluoride is one of the active components in toothpaste.
   a. What is the mass of 2.78 moles of this substance?
   b. How many moles of flluorine in 2.78 mol of tin(II) fluoride?

3. Given a 45.0 g of aluminum nitrate, $Al(NO_3)_3$
   a. How many moles of aluminum nitrate are in this 45.0 g?
   b. How many "ionicules" of aluminum nitrate are in this 45.0 g?
   c. In one single aluminum nitrate ionicule (formula unit), how many oxygen atoms are there?
   d. In 45.0 g of aluminum nitrate, how many total oxygen atoms are there?

4. Consider water molecules.
   a. How many hydrogen atoms are there in one single water molecule?
   b. If you had 35.0 ml of of water, how many hydrogen atoms would you have?
   c. In that same 35.0 ml of water, how many total atoms would you have?

5. Baking soda is sodium bicarbonate. Go home and look at the ingrediants on the box! ($NaHCO_3$)
   a. Given 557 g of baking soda, determine the number of moles of baking soda ionicules you would have.
   b. Determine the number of grams of carbon you would have if given 4.00×10^{24} ionicules (formula units) of baking soda.

6. Magnesium hydroxide, $Mg(OH)_2$ is the main component of "Milk of Magnesia," a common stomach antacid and laxative.
   a. Given 25.0 g of magnesium hydroxide, determine the number of moles of this antacid.
   b. For the same 25 g of magnesium hydroxide, determine the number of moles of hydroxide ions.
   c. Determine the number of ionicules (formula units) of magnesium hydroxide in 25.0 g.

7. A typical air horn uses carbon dioxide as the propellant and contains 150.0 g of carbon dioxide.
   a. Determine the number of moles of carbon dioxide in the horn.
   b. Determine the number of molecules of carbon dioxide in the horn.

8. A sample of 0.3620 moles of a metal, M reacts completely with excess fluorine to form 37.43 grams of MF_2.
   a. How many mole of F are in the sample of MF_2?
   b. What is the mass of F in this sample?
   c. How many grams of M are in this sample?
   d. If you knew the molar mass of metal M you could make a prediction as to what metal M might be. From the info above calculate the molar mass of M. (In other words, make a ratio of mass to moles for M)

9. What is the molar mass of a substance which weighs 5.00 g for every 2.00×10^{22} molecules.
   Hint: Remember that molar mass is the number of grams per mole. (g/mol)

10. Consider 1.4×10^{23} molecules which weighs 7.6 g
    a. Calculate the molar mass of the gas described by the data above.
    Hint: Remember that molar mass is the number of grams per mole. (g/mol)
    b. What is the identity of this common elemental diatomic gas?

 Wholey (Holy) Moley!! ***ANSWERS***

W*atch your significant figures. The number of sig figs in the answer should be based on the numbers in the question, not numbers that you look up in the periodic chart, nor on any 1's in your conversion factors. If the problem is a multi-step problem, keep all the numbers in your calculator and* ***round off at the end of the problem****.*

1. Silver, Ag element #47
   a. $5g \times \frac{1mol}{107.87g} = 0.0464mol$
   b. $0.0464mol \times \frac{6.02 \times 10^{23} atoms}{1mol} = 2.79 \times 10^{22} silver\ atoms$

2. SnF_2 molar mass = 118.71 + 2(19) = 156.71 g/mol
   a. $2.78mol \times \frac{156.71g}{1mol} = 436g$
   b. $2.78molSnF_2 \times \frac{2F's}{1mol} = 5.56molF$

3. $Al(NO_3)_3$ molar mass is 26.98 + 3(14.01) + 9(16) = 213.01 g/1mol
   a. $45gAl(NO_3)_3 \times \frac{1mol}{213.01g} = 0.211mol$
   b. $0.211molAl(NO_3)_3 \times \frac{6.02 \times 10^{23} ionicules}{1mol} = 1.27 \times 10^{23} Al(NO_3)_3\ ionicules$
   c. 9 oxygen atoms per one $Al(NO_3)_3$
   d. $1.27 \times 10^{23} Al(NO_3)_3\ ionicules \times \frac{9oxygenatoms}{1Al(NO_3)_3} = 1.14 \times 10^{24} oxygenatoms$

4. H_2O molar mass is 18.02 g/mole
   a. 2 H atoms per one water molecule
   b. Recall that the density of water is 1 g/ml, thus 35 ml is 35 g
      $35gH_2O \times \frac{1mol}{18.02gH_2O} \times \frac{6.02 \times 10^{23} molecules}{1mol} \times \frac{2H's}{1H_2O} = 2.34 \times 10^{24} H's$
   c. $35gH_2O \times \frac{1mol}{18.02gH_2O} \times \frac{6.02 \times 10^{23} molecules}{1mol} \times \frac{3atoms}{1H_2O} = 1.40 \times 10^{25} atomsTotal$

5. $NaHCO_3$ molar mass is 22.99 + 1.01 + 12.01 +3(16) = 84.01 g/mol
   a. $557gNaHCO_3 \times \frac{1mol}{84.01gNaHCO_3} = 6.63mol$
   b. $4.00 \times 10^{24} ionicules \times \frac{1molNaHCO_3}{6.02 \times 10^{23} ionicules} \times \frac{1C}{1NaHCO_3} \times \frac{12.01g}{1mol} = 79.8g\ of\ C$

6. $Mg(OH)_2$ molar mass = 24.31 + 2(16) + 2(1.01) = 58.33 g/mol
   a. $25gMg(OH)_2 \times \frac{1mol}{58.33gMg(OH)_2} = 0.429molMg(OH)_2$
   b. $25gMg(OH)_2 \times \frac{1molMg(OH)_2}{58.33gMg(OH)_2} \times \frac{2OH's}{1Mg(OH)_2} = 0.857molOH's$
   c. $25gMg(OH)_2 \times \frac{1mol}{58.33gMg(OH)_2} \times \frac{6.02 \times 10^{23} ionicules}{1mol} = 2.58 \times 10^{23} OH's$

7. CO_2 molar mass = 12.01 + 2(16) = 44.01 g/mol

   a. $150 gCO_2 \times \frac{1 mol}{44.01 gCO_2} = 3.408 mole$

   b. $150 gCO_2 \times \frac{1 mol}{44.01 gCO_2} \times \frac{6.02 \times 10^{23} molecules}{1 mol} = 2.052 \times 10^{24} molecules$

8. Three items of information given in the problem.

   a. $0.362 molM \times \frac{2 F's}{1 MF_2} = 0.7240 molF$

   b. $0.724 mol \times \frac{19 g}{1 mol} = 13.76 gF$

   c. $37.43 gTotal - 13.76 gF = 23.67 gM$

   d. $\frac{23.67 gM}{0.362 molM} = 65.39 g / mol$ which is closest to zinc

9. $\frac{5 g}{2 \times 10^{22} molecules} \times \frac{6.02 \times 10^{23} molecules}{1 mol} = 151 g / mol$

10.

   a. $\frac{7.6 g}{1.4 \times 10^{22} molecules} \times \frac{6.02 \times 10^{23} molecules}{1 mol} = 32 g / mol$

   b. Since we are told this molecule is siatomic, the molar mass of the element itself would be 16 g/mol, oxygen.