Name: _____ Date: _____ Mods: _____

Lab # 6 – Mathematics of Chemistry: Molar Mass Calculations

Introduction
     Calculating molar mass, also called gram formula mass, involves using the Periodic Table. You take the number of each element and multiply it by the atomic mass listed for that element. Add up the total mass of each element to get the molar mass.

Example: To get the molar mass of $C_6H_{12}O_6$:

     $C = 6 \times 12$ g $= 72$ g/mol   Now add the results for each element:

     $H = 12 \times 1$ g $= 12$ g/mol $72 + 12 + 96 = 180$ g/mol

     $O = 6 \times 16$ g $= 96$ g/mol

Objectives
     This activity will review various math skills that you will use throughout the year in chemistry.

Calculate the molar masses of the following chemicals (show work):

Cl_2	UF_6
KOH	SO_2
$BeCl_2$	H_3PO_4
$FeCl_3$	$(NH_4)_2SO_4$
BF_3	CH_3COOH
CCl_2F_2	$Pb(NO_3)_2$

Calculations:

1. How many moles are present in 34 grams of $Cu(OH)_2$?

2. How many moles are present in 2.45×10^{23} molecules of CH_4?

3. How many grams are there in 3.4×10^{24} molecules of NH_3?

4. How many grams are in 0.500 moles of $CuBr$?

5. How many molecules are there in 21.6 grams of CH_4?

6. How many moles are in 25 grams of water?

7. How many grams are in 4.5 moles of Li_2O?

8. How many molecules are in 23 moles of oxygen?

9. How many moles are in 3.4×10^{23} molecules of H_2SO_4?

10. How many molecules are in 25 grams of NH_3?

11. How many grams are in 8.2×10^{22} molecules of N_2I_6?

12. Using your knowledge of mole calculations and unit conversions, determine how many atoms there are in 1 gallon of gasoline. Assume that the molecular formula for gasoline is C_6H_{14} and that the density of gasoline is approximately 0.85 grams/mL.

There are _____ atoms in 1 gallon of gasoline.

Name: _____

Empirical Formula and Molecular Formula
Do your working on separate piece of paper and write you answers below.
Attach you working to the back of this worksheet

Definition:
The empirical formula is simplest formula that you can write for an ionic or covalent compound.
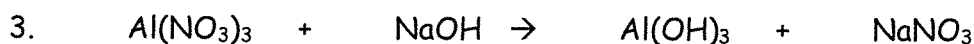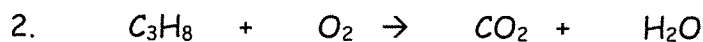
The molecular formula is the actual formula that you should write for a covalent compound
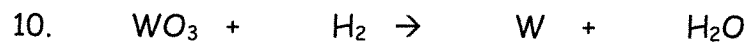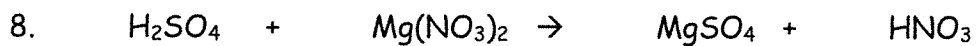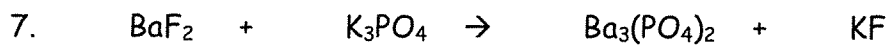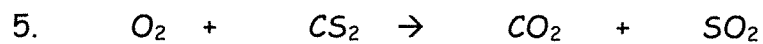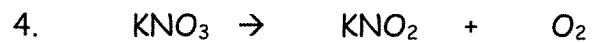
1.   Calculate the following empirical formulas
   a.   carbon 85.7% and hydrogen 14.3%
   b.   2.6 g of chromium combined with 5.3 g of chlorine
   c.   0.62 g of lead combined with 0.064 g of oxygen
   d.   20% magnesium, 26.6 % sulfur, 53.3 % oxygen
   e.   60% carbon, 13.3% hydrogen, 26.7% oxygen

2.   Calculate the Empirical Formulae
   a.   0.62 g of phosphorus combined with 0.48 g of oxygen
   b.   1.4 g of nitrogen combined with 0.30g of hydrogen
   c.   0.62 g of lead combined with 0.064 g oxygen
   d.   3.5 g of silicon combined with 4.0 g of oxygen

3.   Calculate the following.
   a.   A compound has a molecular mass of 28, and contains 85.7% carbon and 14.3% hydrogen. What are the empirical and molecular formulae for this compound?
   b.   A compound has a molecular mass of 58, and contains 82.8% carbon and 17.2% hydrogen. What are the empirical and molecular formulae for this compound?

Worksheet: Balancing Equations   Name _____

I.   **Fill in the blanks with the most appropriate term:**

A _Chemical_ _equation_ tells the story of a chemical reaction. _Reactants_ are the starting substances in the reaction while _products_ are the new substances that are formed. The large numbers in front of some of the formulas are called _coefficients_. These numbers are used to _balance_ the equation because chemical reactions must obey the Law of _conservation_ of Matter. The number of atoms of each element on both sides of the equation must be _equal_ because matter cannot be _created_ or _destroyed_. When balancing equations, the only numbers that can be changed are _coefficients_; remember that _subscripts_ must never be changed in order to balance an equation.

II.   **Balance the following equations:**

1. $Al + O_2 \rightarrow Al_2O_3$

2. $C_3H_8 + O_2 \rightarrow CO_2 + H_2O$

3. $Al(NO_3)_3 + NaOH \rightarrow Al(OH)_3 + NaNO_3$

4. KNO_3 → KNO_2 + O_2

5. O_2 + CS_2 → CO_2 + SO_2

6. $KClO_3$ → KCl + O_2

7. BaF_2 + K_3PO_4 → $Ba_3(PO_4)_2$ + KF

8. H_2SO_4 + $Mg(NO_3)_2$ → $MgSO_4$ + HNO_3

9. Al + H_2SO_4 → $Al_2(SO_4)_3$ + H_2

10. WO_3 + H_2 → W + H_2O
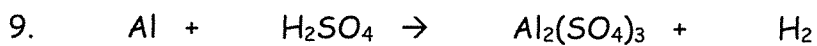
Honors Physical Science
Chemical Equations

Name:_____

Write the balanced chemical equation for the following reactions. Be sure to list the reaction type.

1. A solution of lithium bromide is mixed with gaseous chloride to make lithium chloride and chlorine

2. Powdered copper is slowly stirred into an aqueous solution of lead(II) nitrate resulting in a copper(II) nitrate solution and lead.

3. Solid calcium carbonate is heated to release carbon dioxide gas and solid calcium oxide.

4. Solid diphosphorus pentoxide is mixed with water to form an acid, (H_3PO_4).

5. A solution of magnesium hydroxide is mixed with a solution of phosphoric acid (H_3PO_4) to form magnesium phosphate solution and water.

6. Washing soda, sodium carbonate decahydrate, is a hydrate compound used for washing, water softening, and bleaching. When heated what will the reaction be?

7. Mercury(II) sulfate reacts with ammonium nitrate to yield mercury(II) nitrate and ammonium sulfate.

8. Calcium oxide will react with diphosphorus pentoxide to form calcium phosphate.

9. Lithium metal reacts with water to make lithium hydroxide and hydrogen gas.

10. When copper(II) hydroxide is heated, copper(II) oxide and water are formed.

Reaction Type Worksheet

Name:_____

Name the type of the reaction given.

1._____ $2\ Al\ +\ N_2 \rightarrow 2\ AlN$

2._____ $NH_4 \rightarrow N_2O\ +\ 2\ H_2O$

3._____ $3\ Zn\ +\ 2\ H_3PO_4 \rightarrow Zn_3(PO_4)_2 + 3\ H_2$

4._____ $2\ KNO_3 \rightarrow 2\ KNO_2\ +\ O_2$

5._____ $4\ P\ +\ 5\ O_2 \rightarrow P_4O_{10}$

6._____ $2\ Al\ +\ 3\ H_2SO_4 \rightarrow Al_2(SO_4)_3\ +\ 3\ H_2$

7._____ $Zn\ +\ 2\ AgNO_3 \rightarrow Zn(NO_3)_2\ +\ 2\ Ag$

8._____ $2\ NaNO_3\ +\ H_2SO_4 \rightarrow Na_2SO_4\ +\ 2\ HNO_3$

9._____ $4\ Al\ +\ 3\ O_2 \rightarrow 2\ Al_2O_3$

10._____ $2\ NaCl\ +\ H_2SO_4 \rightarrow Na_2SO_4\ +\ 2\ HCl$

11._____ $FeCl_3\ +\ H_3PO_4 \rightarrow FePO_4\ +\ 3\ HCl$

12._____ $2\ SO_2\ +\ O_2 \rightarrow 2\ SO_3$

13._____ $2\ HgO \rightarrow 2\ Hg\ +\ O_2$

14._____ $2\ H_2O_2 \rightarrow 2\ H_2O\ +\ O_2$

15._____ $2\ NH_3 \rightarrow N_2\ +\ 3\ H_2$