

Name \_\_\_\_\_ Date \_\_\_\_\_

**Molar Mass**

**Directions:** Determine the molar mass (the mass of one mole) of each compound below

1. KCl \_\_\_\_\_

2.  $\text{Ca}(\text{NO}_3)_2$  \_\_\_\_\_

3.  $\text{H}_2\text{CO}_3$  \_\_\_\_\_

4.  $\text{HNO}_3$  \_\_\_\_\_

5.  $\text{Na}_2\text{SO}_4$  \_\_\_\_\_

6.  $\text{C}_6\text{H}_8\text{O}_6$  \_\_\_\_\_

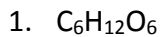
7.  $\text{Mg}_3(\text{PO}_4)_2$  \_\_\_\_\_

8.  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  \_\_\_\_\_

Name \_\_\_\_\_ Date \_\_\_\_\_

### Percent Composition

**Directions:** Determine the percent composition by mass of each of the following compounds.



C = \_\_\_\_\_

H = \_\_\_\_\_

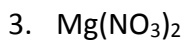
O = \_\_\_\_\_



N = \_\_\_\_\_

H = \_\_\_\_\_

O = \_\_\_\_\_



Mg = \_\_\_\_\_

N = \_\_\_\_\_

O = \_\_\_\_\_



K = \_\_\_\_\_

Mn = \_\_\_\_\_

O = \_\_\_\_\_



Pb = \_\_\_\_\_

C = \_\_\_\_\_

H = \_\_\_\_\_

O = \_\_\_\_\_

Name \_\_\_\_\_ Date \_\_\_\_\_

### Mole Conversions

**Directions:** Determine the number of **moles** in each of the quantities below.

1. 130 g of H<sub>2</sub>SO<sub>4</sub> \_\_\_\_\_
2. 87 g of KCl \_\_\_\_\_

**Directions:** Determine the number of **grams** in each of the quantities below.

3. 3.5 moles of NaCl \_\_\_\_\_
4. 2.80 moles of KMnO<sub>4</sub> \_\_\_\_\_

**Directions:** Determine the number of **molecules** in the quantities below.

5. 2.2 moles \_\_\_\_\_
6. 0.17 moles \_\_\_\_\_

**Directions:** Solve the following problems.

7. How many grams are there in  $1.2 \times 10^{26}$  molecules of CO<sub>2</sub>? \_\_\_\_\_
8. What volume would the CO<sub>2</sub> in Problem 7 occupy at STP? \_\_\_\_\_
9. A sample of NH<sub>3</sub> gas occupies 82.0 liters at STP.  
How many molecules is this? \_\_\_\_\_
10. What is the mass of the sample of NH<sub>3</sub> in Problem 9? \_\_\_\_\_
11. How many moles are there in  $1.3 \times 10^{22}$  molecules of NO<sub>2</sub>? \_\_\_\_\_  
How many atoms? \_\_\_\_\_

Name \_\_\_\_\_ Date \_\_\_\_\_

### Empirical Formula

**Directions:** Determine the empirical formula for each compound below.

1. 74.51% Pb, 25.49% Cl \_\_\_\_\_

2. 52.55% Ba, 10.72% N, 36.73% O \_\_\_\_\_

3. 32.4% sodium, 22.5% sulfur, 45.1% oxygen \_\_\_\_\_

4. 29.15% N, 8.41% H, 12.50% C, 49.94% O \_\_\_\_\_

5. 10.52 g Ni, 4.38 g C, and 5.10 g N \_\_\_\_\_

6. Glycerol is a thick, sweet liquid obtained as a byproduct of the manufacture of soap. Its percent composition is 39.12% carbon, 8.75% hydrogen, and 52.12% oxygen. What is its empirical formula?  
\_\_\_\_\_

7. Analysis of a compound containing chlorine and lead reveals that the compound is 59.37% lead. What is the empirical formula of this compound?

Name \_\_\_\_\_ Date \_\_\_\_\_

**Molecular Formula**

**Directions:** Determine the molecular formula for each compound below.

1. empirical formula CH, molar mass 78 g/mol \_\_\_\_\_

2. empirical formula NH<sub>2</sub>, molar mass 32.06 g/mol \_\_\_\_\_

3. empirical formula NO<sub>2</sub>, molar mass 92 g/mol \_\_\_\_\_

4. empirical formula OCNCl, molar mass 232.41 g/mol \_\_\_\_\_

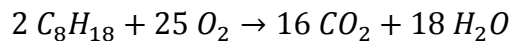
5. A compound with an empirical formula of CH<sub>2</sub>O has a molar mass of 60. g/mol. What is its molecular formula?  
\_\_\_\_\_

6. Determine the molecular formula for ibuprofen, a common headache remedy. Analysis of ibuprofen yields a molar mass of 206 g/mol and a percent composition of 75.7% C, 8.80% H and 15.5% O.  
\_\_\_\_\_

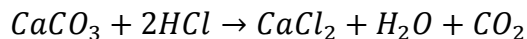
Name \_\_\_\_\_ Date \_\_\_\_\_

**Stoichiometry Practice****Mole-to-Mole Conversions****Directions:** Solve the following problems.

1. If the following equation occurs:



- a. How many moles of oxygen are required to react completely with 3.5 mol  $C_8H_{18}$ ?
- b. How many moles of  $CO_2$  will be produced if the conditions in Question 1a are met?
2. One of the main components of pearls is calcium carbonate. If pearls are put in acidic solution, they dissolve.

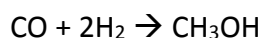


- a. How many moles of  $CaCO_3$  can be dissolved in 0.0350 mol HCl?
- b. How many moles of  $CaCl_2$  will be produced if the conditions in Question 2a are met?

Name \_\_\_\_\_ Date \_\_\_\_\_

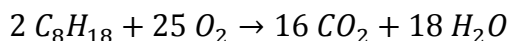
**Mass-to-Mass Conversions****Directions:** Solve the following problems.

1. The fuel methanol (CH<sub>3</sub>OH) is made by the reaction of carbon monoxide and hydrogen.



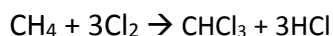
- a. How many grams of hydrogen are needed to produce 55.0 grams of methanol?
- b. How many grams of methanol will be produced if 149 grams of carbon monoxide is used (hydrogen is in excess).

2. If the following equation occurs:



- a. What mass of oxygen is required to completely react with 4 mol C<sub>8</sub>H<sub>18</sub>?
- b. What is the mass of CO<sub>2</sub> produced if the conditions in Question 4a are met?

3. Chloroform (CHCl<sub>3</sub>), an important solvent, is produced by a reaction between methane (CH<sub>4</sub>) and chlorine. The other product is hydrochloric acid (HCl).



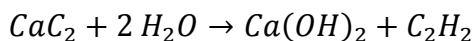
- a. How many grams of CH<sub>4</sub> are needed to produce 60.0 grams of CHCl<sub>3</sub>?
- b. How many grams of HCl will be produced if the conditions in Question 5b are met?

Name \_\_\_\_\_ Date \_\_\_\_\_

**More Stoichiometry Practice****Directions:** Solve the following problems.

1. Car batteries use solid lead and lead(IV) oxide with sulfuric acid solution produce an electric current. The products of this reaction are lead(II) sulfate in solution and water.
  - a. Write the balanced chemical equation for this reaction.
  - b. Determine the mass of lead(II) sulfate produced when 24.0g lead reacts with an excess of lead(IV) oxide and sulfuric acid.

2. Use this equation to solve this problem:



If 6.30 mol calcium carbide ( $\text{CaC}_2$ ) reacts with an excess of water, how many moles of acetylene ( $\text{C}_2\text{H}_2$ ) will be produced?

3. A car's catalytic converter combines carbon monoxide with oxygen to form carbon dioxide gas.
  - a. Write the balanced equation for this reaction.
  - b. What volume of oxygen is required to that 650 mL of carbon monoxide gas is completely converted to carbon dioxide?
  - c. How many liters of carbon dioxide are produced if the catalytic converter processes 7.25 L of carbon monoxide?
4. Why is a balanced chemical equation required to solve stoichiometry problems?