

Lab results: 1 doz grains of rice = \_\_\_\_\_ g (Use this fact as a conversion factor.)

? grains of rice = 1.94 g

Avogadro's Number - the \_\_\_\_\_ = the number \_\_\_\_\_

Molar Mass

the \_\_\_\_\_ of one \_\_\_\_\_ of any \_\_\_\_\_

molar mass of an element (g/mol)

equals the \_\_\_\_\_ of the element in grams

molar mass of a compound

equals the \_\_\_\_\_ of the \_\_\_\_\_ of the \_\_\_\_\_ making up the \_\_\_\_\_

example problems:

Find the molar masses of-

magnesium \_\_\_\_\_ g/mol

chlorine \_\_\_\_\_ g/mol

magnesium chloride \_\_\_\_\_ g/mol

Find the molar mass of aluminum oxide.

How many moles of atoms are there in 8.0 g of Mg?

How many atoms are in 0.7 g of He?

*Work Problem Set #1 on back.*

more example problems:

What would be the mass of  $5.3 \times 10^{22}$  formula units of calcium iodide?

Episode 701 Problems: *Fill in masses from lab data and solve.*

How many atoms are in \_\_\_\_\_ grams of copper?

How many formula units are in \_\_\_\_\_ grams of salt?

How many molecules are in \_\_\_\_\_ grams of water?

### The Chemistry Quiz

CR1. \_\_\_\_\_

CR2. \_\_\_\_\_

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

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

Problem Set One: Episode 701

How many atoms are in 3.5 grams of silicon?

How many formula units are in  
32.6 grams of potassium oxide?

How many molecules are in  
0.25 grams of dinitrogen pentoxide?



5. Convert 3.00 moles  $\text{As}_2\text{S}_3$  to grams.
  
6. How many moles are represented by 11.5 g of  $\text{C}_2\text{H}_5\text{OH}$ ?
  
7. What is the mass of 9.30 moles of  $\text{SiH}_4$ ?
  
8. Convert  $8.00 \times 10^{20}$  molecules of  $\text{H}_2$  to moles.
  
9. How many atoms of tin are found in 3.50 moles of tin?
  
10. How many grams of tin are found in 3.50 moles of tin?

Bonus: How many atoms of hydrogen are found in 12.6 moles of water?

How many atoms are in a sample of copper with a mass of 18.46 grams?

How many formula units are in a sample of salt with a mass of 67.69 grams?

How many molecules are in a sample of water with a mass of 44.99 grams?

What is the mass in grams of 0.250 moles of Mg?

How many moles of atoms are there in 48.096 g of sulfur?

What is the mass of 24.6 formula units of magnesium oxide?

How many molecules of dinitrogen pentoxide are contained in 123.46 g of dinitrogen pentoxide?



What is the mass of 4.56 moles of sulfur dioxide?

What is the mass of  $4.56 \times 10^{23}$  molecules of sulfur dioxide?

How many formula units are in 0.456 g of  $\text{Ca}_3(\text{PO}_4)_2$ ?

How many moles are in  $1.5 \times 10^{23}$  atoms of fluorine?

What is the mass of  $2.80 \times 10^{26}$  molecules of  $\text{CO}_2$ ?

Work each of the following problems. SHOW ALL WORK.

1. How many atoms are contained in 3.46 moles of magnesium?
2. Convert 256.3 g sodium carbonate to formula units.
3. What is the mass of 12.4 molecules of carbon tetrachloride?
4. How many moles are contained in 0.43 g  $\text{Al}_2\text{O}_3$ ?
5. The number of silicon atoms in 42.1 g of silicon is \_\_\_\_\_.
6. 11.6 g of  $\text{CuCl}_2$  = \_\_\_\_\_ moles  $\text{CuCl}_2$

7. Convert 2.76 g Se to moles Se.

8. What is the mass in grams of  $9.31 \times 10^{21}$  atoms of carbon?

9. 2.86 f.u. MgO = \_\_\_\_\_ moles MgO

10. How many grams of sodium is equal to  $6.92 \times 10^{21}$  atoms of sodium?

11. The mass of 3.55 moles of NaCl is \_\_\_\_\_.

**BONUS**

What is the mass, in kilograms, of  $2.46 \times 10^{20}$  formula units of barium chloride?



7. Convert 3.1 moles of water to grams of water.

8. What is the mass in grams of  $4.6 \times 10^{21}$  molecules of carbon tetrabromide?

9.  $3.2 \times 10^{23}$  f.u. NaCl = \_\_\_\_\_ grams NaCl

10. How many moles of silver is equal to 0.31 grams of silver?

11. The mass of 2.60 moles of  $\text{SO}_2$  is \_\_\_\_\_.

**BONUS**

How many atoms of oxygen are contained in 12.3 kilograms of carbon dioxide?

Example Problem: Find the % by mass of oxygen in water.

Percentage by mass of element in a compound =

$$(\text{mass of element in 1 mol of compound} \div \text{molar mass of compound}) \times 100 \%$$

*(after completing lab #1)*

Find the % of carbon in sodium bicarbonate ( $\text{NaHCO}_3$ ).

Find the % composition of aluminum oxide. (This means to find the % of each element in the compound.)

Empirical Formula: simplest \_\_\_\_\_ number \_\_\_\_\_ of  
\_\_\_\_\_ in a \_\_\_\_\_

Example Problem: Find the empirical formula for a compound  
containing 56.6g of K, 8.7g of C, and 34.7g of O.

Step #1: Convert each mass into moles of the element.

Step #2: Divide each by the smallest to find a simple whole number ratio.

Ex. Problems: *Work on separate sheet of paper.*

\_\_\_\_\_ % Na

\_\_\_\_\_ % S

\_\_\_\_\_ % O

(Hint: When % are given, assume you have 100g of the compound, and the % changes to grams.)

$P_xO_y$

\_\_\_\_\_ g sample

\_\_\_\_\_ g P

(Hint: After step 2, if the ratio is still not whole numbers, multiply both subscripts by a number, such as "2" to get rid of fractions, such as "0.5".)

### The Chemistry Quiz

CR1. \_\_\_\_\_

CR2. \_\_\_\_\_

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

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_





Calculate the % composition for  $\text{Mg}(\text{OH})_2$ .

What is the empirical formula for a compound if a 2.50 g sample contains 0.900 g of calcium and 1.60 g of chlorine?

Calculate the % composition for potassium sulfate.

A compound is 85.7 % carbon and 14.3 % hydrogen. Calculate the empirical formula.



Molecular Formula

- represents the \_\_\_\_\_ number of \_\_\_\_\_ of each \_\_\_\_\_ in the \_\_\_\_\_
- not necessary for \_\_\_\_\_
- necessary for \_\_\_\_\_

The molecular formula for water is \_\_\_\_\_, and empirical formula is also \_\_\_\_\_.

The molecular formula for hydrogen peroxide is \_\_\_\_\_, and empirical formula is \_\_\_\_\_.

Example Problem

The empirical formula for glucose is  $\text{CH}_2\text{O}$ .

a) If the molar mass is 180.0 g/mole, find the molecular formula.

b) If the molar mass is \_\_\_\_\_ g/mole, find the molecular formula.

Problem Set One (work on your own paper)

empirical formula	molar mass
CH	_____ g/mol
$\text{NO}_2$	_____ g/mol
$\text{C}_3\text{H}_8$	_____ g/mol

Ex. Problem: Find the molecular formula for a compound with-  
 \_\_\_\_\_ g N    \_\_\_\_\_ g O    molar mass \_\_\_\_\_ g/mol

## Hydrates

- \_\_\_\_\_ with \_\_\_\_\_ molecules adhering to the \_\_\_\_\_ or \_\_\_\_\_
- $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$   
indicates \_\_\_\_\_ molecules adhering to each \_\_\_\_\_ of sodium carbonate
- mass of \_\_\_\_\_ = mass of \_\_\_\_\_ compound minus mass of \_\_\_\_\_ compound

## Example Problems

Determine the formula of hydrated barium chloride from this data:

initial mass of hydrated compound = 1.373g

mass after heating = 1.175g

Determine the formula for the hydrate that is \_\_\_\_\_ %  $\text{CaSO}_3$  and \_\_\_\_\_ %  $\text{H}_2\text{O}$ . (*work on back*)

## The Chemistry Quiz

CR1.

CR2.

1.

2.

3.

4.

5.

Problem Set One: Episode 703

empirical formula	molar mass
CH	26 g/mol
NO <sub>2</sub>	230 g/mol
C <sub>3</sub> H <sub>8</sub>	44 g/mol



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

\_\_\_\_\_ is also called Avogadro's number. The mass of one mole of any pure substance is called the \_\_\_\_\_ mass. For any element, this mass is equal to the atomic mass with the unit \_\_\_\_\_/\_\_\_\_\_.

The \_\_\_\_\_ formula of a compound is the simplest whole number ratio of atoms, while the \_\_\_\_\_ formula of a compound represents the actual number of each atom in the compound.

\_\_\_\_\_ are compounds that crystallize from a water solution with water molecules clinging to the crystal particles.

**Problems:** Work each of the following problems showing all work. These problems are representative of each type of problem worked in this unit. For more practice on a given type of problem, refer back to Note Taking Guides, worksheets, and quizzes.

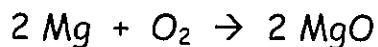
1. Calculate the molar mass for ethane,  $C_2H_6$ .
2. Convert 45 g Se to moles of Se.
3. Convert  $4.77 \times 10^{24}$  molecules of  $SO_2$  to grams.

4. What is the percentage composition of sodium hydroxide, NaOH?
  
  
  
  
  
  
  
  
  
  
5. A compound is found to contain 63 % manganese, Mn, and 37 % oxygen. What is the compound's empirical formula?
  
  
  
  
  
  
  
  
  
  
6. What is the empirical formula for a substance if a 1.000 g sample of it contains 0.262 grams of nitrogen, 0.075 grams of hydrogen, and 0.663 grams of chlorine?
  
  
  
  
  
  
  
  
  
  
7. What is the molecular formula for a compound with an empirical formula of  $\text{NO}_2$  and a molar mass of 92.0 g/mol?
  
  
  
  
  
  
  
  
  
  
8. What is the formula for a hydrate that contains 6.4 g  $\text{CuSO}_4$  and 3.6 g  $\text{H}_2\text{O}$ ?



Stoichiometry

- study of the \_\_\_\_\_ relationships in a \_\_\_\_\_
- based on \_\_\_\_\_ equations



The \_\_\_\_\_ in a \_\_\_\_\_ give the  
 \_\_\_\_\_ for the \_\_\_\_\_ involved in the  
 \_\_\_\_\_.

Ex. Problem:

When elemental aluminum reacts with elemental iodine, aluminum iodide is produced.

mole ratios:      \_\_\_\_\_ Al: \_\_\_\_\_ I<sub>2</sub>  
                           \_\_\_\_\_ Al: \_\_\_\_\_ AlI<sub>3</sub>  
                           \_\_\_\_\_ I<sub>2</sub>: \_\_\_\_\_ AlI<sub>3</sub>

If you start with 4 moles of Al, how many moles of AlI<sub>3</sub> will be produced?

## Problem Set One

How many moles of water will be produced when \_\_\_\_\_ grams of hydrogen gas react with the oxygen in the air?

(Hint: To "make the switch" between different substances in a reaction, use the \_\_\_\_\_ ratio from the \_\_\_\_\_ equation.)

## Problem Set Two

### The Chemistry Quiz

CR1.

CR2.

1.

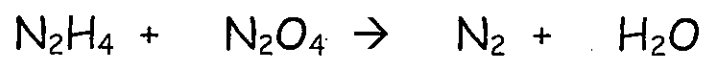
2.

3.

4.

5.

Problem Set One: Episode 801



BE SURE TO BALANCE THE EQUATION FIRST!!

$$? \text{ moles N}_2\text{O}_4 = 2.72 \text{ moles N}_2\text{H}_4$$

$$? \text{ moles N}_2 = 2.72 \text{ moles N}_2\text{H}_4$$

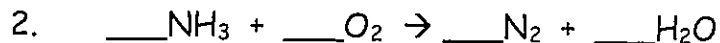
Answer each of the following questions using the equation provided. BE SURE TO BALANCE EACH EQUATION BEFORE SOLVING ANY PROBLEMS. SHOW ALL WORK.



a. 2 moles of NO will react with \_\_\_\_\_ mole(s) of O<sub>2</sub> to produce \_\_\_\_\_ mole(s) of NO<sub>2</sub>.

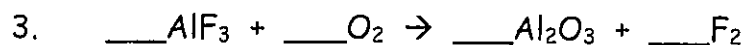
b. ? moles NO<sub>2</sub> = 3.6 moles O<sub>2</sub> ×  $\frac{\text{moles NO}_2}{\text{moles O}_2} =$

c. How many moles of NO must react to form 4.67 moles of NO<sub>2</sub>?



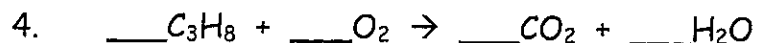
a. 20 moles of NH<sub>3</sub> are needed to produce \_\_\_\_\_ moles of H<sub>2</sub>O.

b. How many moles of N<sub>2</sub> will be produced if 3.5 moles of O<sub>2</sub> react?



a. 20 moles of  $\text{AlF}_3$  will produce  $\underline{\hspace{2cm}}$  moles of  $\text{F}_2$ .

b.  $\underline{\hspace{2cm}}$  moles of  $\text{AlF}_3$  will react with 0.6 moles of  $\text{O}_2$ .



a. How many moles of oxygen react with 11 moles of  $\text{C}_3\text{H}_8$ ?

b. How many moles of  $\text{CO}_2$  are produced if 3.5 moles of water are produced?

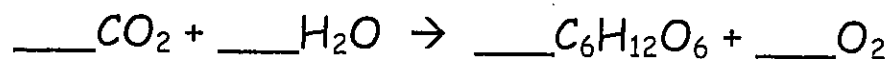


a. Fill in the following word equation-- $\underline{\hspace{2cm}}$  moles of oxygen gas react with  $\underline{\hspace{2cm}}$  moles of iron to produce  $\underline{\hspace{2cm}}$  moles of iron (III) oxide.

b.  $\underline{\hspace{2cm}}$  moles of  $\text{O}_2$  are required to produce 3.0 moles of iron (III) oxide.

Problem Set Two: Episode 801

In photosynthesis, carbon dioxide and water react to form glucose,  $C_6H_{12}O_6$  and oxygen gas.



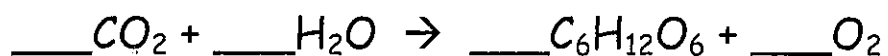
BE SURE TO BALANCE THE EQUATION FIRST!!

If 15.6 grams of carbon dioxide react, how many moles of glucose will be produced?

How many grams of carbon dioxide must react to produce 0.25 moles of glucose?

Problem Set Two: Episode 801

In photosynthesis, carbon dioxide and water react to form glucose,  $C_6H_{12}O_6$  and oxygen gas.



BE SURE TO BALANCE THE EQUATION FIRST!!

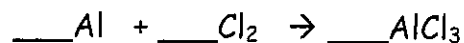
If 15.6 grams of carbon dioxide react, how many moles of glucose will be produced?

How many grams of carbon dioxide must react to produce 0.25 moles of glucose?



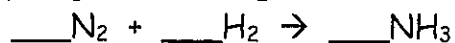
Answer each of the following questions using the equation provided. BE SURE TO BALANCE EACH EQUATION BEFORE SOLVING ANY PROBLEMS. SHOW ALL WORK.

1. In a reaction between the elements aluminum and chlorine, aluminum chloride is produced.



- a. 2 moles of Al will react with \_\_\_\_\_ mole(s) of  $\text{Cl}_2$  to produce \_\_\_\_\_ mole(s) of  $\text{AlCl}_3$ .
- b. How many grams of  $\text{AlCl}_3$  will be produced if 2.50 moles of Al react?
- c. How many moles of  $\text{Cl}_2$  must react to produce 12.3 g of  $\text{AlCl}_3$ ?
- d. How many grams of aluminum will react with 3.4 moles of chlorine?
- e. If 17 grams of aluminum react, how many moles of aluminum chloride will be produced?

2. The ammonia ( $\text{NH}_3$ ) used to make fertilizers for lawns and gardens is made by reacting nitrogen and hydrogen according to the following reaction.



- a. Determine the mass in grams of  $\text{NH}_3$  formed from 1.34 moles of nitrogen.
  
  
  
  
  
  
  
  
  
  
- b. What is the mass in grams of hydrogen required to react with 1.34 moles of nitrogen?
  
  
  
  
  
  
  
  
  
  
- c. How many moles of nitrogen are required to produce 11.7 moles of  $\text{NH}_3$ ?
  
  
  
  
  
  
  
  
  
  
- d. How many moles of nitrogen are required to produce 11.7 grams of  $\text{NH}_3$ ?
  
  
  
  
  
  
  
  
  
  
- e. How many grams of hydrogen are required to form 3.5 moles of  $\text{NH}_3$ ?

The first step in the industrial manufacture of nitric acid involves the catalytic oxidation of ammonia according to the following BALANCED equation.

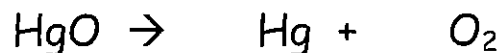


How many moles of NO are formed if 824 g of  $\text{NH}_3$  react?

How many grams of water are formed if 2.5 moles of ammonia are oxidized?

How many moles of oxygen are needed to react with 4.6 moles of ammonia?

Mercury (II) oxide decomposes into mercury and oxygen gas according to the following UNBALANCED equation.



How many moles of mercury (II) oxide are needed to produce 125 g of oxygen?

How many moles of mercury are produced if 24.5 moles of mercury (II) oxide decompose?

How many grams of oxygen will be produced if 2.3 moles of mercury are produced?

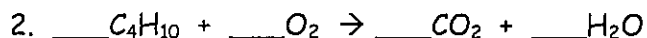
**Worksheet: Mixed Problems—Mole/Mole  
and Mole/Mass**

Name \_\_\_\_\_

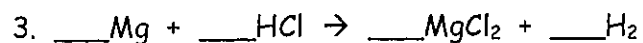
Answer each of the following questions using the equation provided. BE SURE TO BALANCE EACH EQUATION BEFORE SOLVING ANY PROBLEMS. SHOW ALL WORK.



- a. If 101 grams of copper is used, how many moles of copper (II) oxide will be formed?
  
  
  
  
  
  
  
  
  
  
- b. If 5.25 moles of copper are used, how many moles of oxygen must also be used?
  
  
  
  
  
  
  
  
  
  
- c. If 78.2 grams of oxygen react with copper, how many moles of copper (II) oxide will be produced?



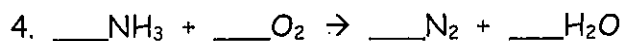
- a. How many moles of butane,  $\text{C}_4\text{H}_{10}$ , are needed to react with 5.5 moles of oxygen?
  
  
  
  
  
  
  
  
  
  
- b. How many grams of carbon dioxide will be produced if 3.5 moles of  $\text{O}_2$  react?



a. What mass of HCl is consumed by the reaction of 2.50 moles of magnesium?

b. What mass of  $\text{MgCl}_2$  is produced if 3.67 moles of HCl react?

c. How many moles of hydrogen gas are produced when 3.0 moles of magnesium react?



a. How many moles of oxygen react with 0.23 moles of  $\text{NH}_3$ ?

b. How many grams of water will be produced if 0.55 moles of oxygen react?

c. How many moles of nitrogen gas will be produced if 12.6 grams of ammonia react?

Use what you have learned about stoichiometry so far to try to solve the following problem. If you don't get it, the solution will be given to you in Episode 802.

When nitrogen and hydrogen react, they form ammonia gas, which has the formula  $\text{NH}_3$ . If 56.0 g of nitrogen are used up in the reaction, how many grams of ammonia will be produced?

Ex. Problems:

Sodium metal reacts with oxygen to produce solid sodium oxide. How many grams of sodium must react to produce \_\_\_\_\_ g of sodium oxide?

When \_\_\_\_\_ g of hydrogen reacts with oxygen, how many grams of water are produced?

Actual Yield: amount of \_\_\_\_\_ produced when the \_\_\_\_\_ is performed in a \_\_\_\_\_

Theoretical Yield: amount of \_\_\_\_\_ expected to be \_\_\_\_\_ based on the \_\_\_\_\_ and the amount of \_\_\_\_\_

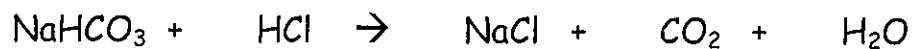
Percent Yield  
(\_\_\_\_\_ yield / \_\_\_\_\_ yield) x 100%



Percent Yield in Lab

actual yield of  $\text{CO}_2$  = \_\_\_\_\_ (from lab data)

Calculate theoretical yield from balanced equation:



?g  $\text{CO}_2$  = 0.23 g  $\text{NaHCO}_3$

% yield =

What is the % yield of carbon dioxide when \_\_\_\_\_ grams of propane are burned and \_\_\_\_\_ grams of carbon dioxide are collected?

The Chemistry Quiz

CR1.

CR2.

1.

2.

3.

4.

5.

Sodium metal reacts with oxygen gas to produce solid sodium oxide. How many grams of sodium must react to produce 42.0 grams of sodium oxide?

WRITE THE BALANCED EQUATION FIRST!!!!

When 12.0 grams of hydrogen react with oxygen, how many grams of water are produced?

**WRITE THE BALANCED EQUATION FIRST!!!!**

1. Nitrogen and hydrogen react to form ammonia gas according to the following equation.

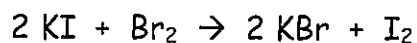


- a. If 56.0 grams of nitrogen are used up by the reaction, how many grams of ammonia will be produced?
- b. How many grams of hydrogen must react if the reaction needs to produce 63.5 grams of ammonia?
2. Aluminum metal reacts with zinc chloride to produce zinc metal and aluminum chloride.

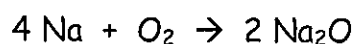


- a. A mass of 45.0 grams of aluminum will react with how many grams of zinc chloride?
- b. What mass of aluminum chloride will be produced if 22.6 grams of zinc chloride are used up in the reaction?

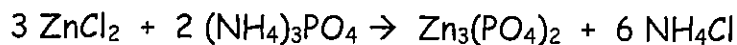
3. For the reaction whose balanced equation is as follows, find the number of grams of  $I_2$  that will be formed when 300.0 g of bromine react.



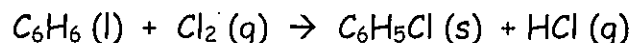
4. For the reaction whose balanced equation is as follows, find the number of grams of sodium that must react to produce 42.0 grams of sodium oxide.



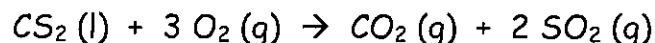
5. For the reaction whose balanced equation is as follows, find how many grams of zinc phosphate will be produced by the reaction of 5.00 grams of ammonium phosphate.



1. Chlorobenzene,  $C_6H_5Cl$ , is used in the production of chemicals such as aspirin and dyes. One way that chlorobenzene is prepared is by reacting benzene,  $C_6H_6$ , with chlorine gas according to the following BALANCED equation.



- a. What is the theoretical yield if 45.6 g of benzene react?
- b. If the actual yield is 63.7 g of chlorobenzene, calculate the percent yield.
2. When carbon disulfide burns in the presence of oxygen, sulfur dioxide and carbon dioxide are produced according to the following equation.



- a. What is the percent yield of sulfur dioxide if the burning of 25.0 g of carbon disulfide produces 40.5 g of sulfur dioxide?
- b. What is the percent yield of carbon dioxide if 2.5 mol of oxygen react and 32.4 g of carbon dioxide are produced?

1. You are making brownies for a bake sale. Each batch of brownies requires one box of brownie mix,  $\frac{1}{4}$  cup oil,  $\frac{1}{2}$  cup water, and 2 eggs. You have 12 boxes of brownie mix, 12 cups of oil, 12 cups of water, and 12 eggs. How many batches of brownies can you make?      **SHOW YOUR WORK!!**

2. You are making goody bags for you little sister's birthday party. Each goody bag has 6 pieces of candy, 1 noise maker, 3 stickers, 1 bouncy ball, 5 tiny containers of play dough, and 2 tiny containers of bubbles. Your mom has purchased 48 pieces of candy, 6 noise makers, 54 stickers, 12 bouncy balls, 35 tiny containers of play dough, and 35 tiny containers of bubbles. How many goody bags can you make?      **SHOW YOUR WORK!!**

3. You are going into the business of making pizzas. The following is the list of ingredients to make **ONE** pizza.

400 g flour	50 mL water	10 g yeast	120 g sauce
250 g cheese	5 g oregano	5 g basil	

Your business has purchased 500 pizza pans, 60 kg of sauce, 100 kg of cheese, 2.5 kg of basil, 2.5 kg of oregano, 5 kg of yeast, and 200 kg of flour. You have as much water as you need. How many pizzas can you make? **SHOW YOUR WORK ON THE BACK!!**



Stoichiometry Problem Guidelines:

1. \_\_\_\_\_ the equation
2. convert to \_\_\_\_\_ of \_\_\_\_\_ substance
3. MAKE THE \_\_\_\_\_ USING \_\_\_\_\_  
FROM BALANCED EQUATION
4. convert to \_\_\_\_\_

Problem Set One

### Limiting Reactant

\_\_\_\_\_ used up \_\_\_\_\_ in a \_\_\_\_\_ reaction.

### Excess Reactant

\_\_\_\_\_ that is not used up in a chemical \_\_\_\_\_

Ex. Problem:

When  $\text{FeCl}_3$  reacts with  $\text{O}_2$ ,  $\text{Fe}_2\text{O}_3$  and  $\text{Cl}_2$  are produced. If 4.0 moles of  $\text{FeCl}_3$  and 4.0 moles of  $\text{O}_2$  are mixed, how many grams of  $\text{Fe}_2\text{O}_3$  will be produced?

→

(Hint: Work two separate problems, using one reactant at a time.)

(Hint: Answer will be the (smaller, larger) amount of product.)

What is the limiting reactant?

What is the excess reactant?

### Problem Set Two (Work on back.)

#### The Chemistry Quiz

CR1.

CR2.

1.

2.

3.

4.

5.

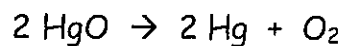


BALANCE THE EQUATION!!!!!!!

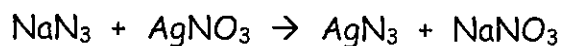
Given that the density of carbon dioxide is approximately 1.99 g/L, what *volume*, in liters, of carbon dioxide will be produced if 85.0 g of pentane are burned?

How many *molecules* of water will be produced if 26.3 g of pentane are burned?

1. When mercury (II) oxide is heated, it decomposes into mercury and oxygen gas according to the following BALANCED equation.



- a. Given that the density of oxygen is 1.439 g/L, how many liters of oxygen gas can be produced if 2.0 moles of mercury (II) oxide are heated?
- b. How many molecules of oxygen gas are produced if 25.0 g of mercury (II) oxide are heated?
2. How many molecules of sodium nitrate are produced when 20.0 g of sodium azide,  $\text{NaN}_3$ , react according to the following BALANCED equation?



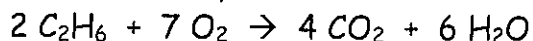
1. BALANCE the equation first.  $\text{FeCl}_3 + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3 + \text{Cl}_2$

a. How many moles of chlorine gas can be produced if 4 moles of  $\text{FeCl}_3$  react with 4 moles of  $\text{O}_2$ ? SHOW ALL WORK!

b. What is the limiting reactant?

c. What is the excess reactant?

2. Use the following BALANCED equation.



a. If 15 g of  $\text{C}_2\text{H}_6$  react with 45 g of  $\text{O}_2$ , how many grams of water will be produced?

b. What is the limiting reactant?

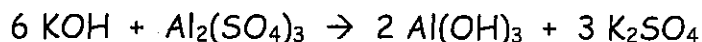
c. What is the excess reactant?

Part 1—terminology

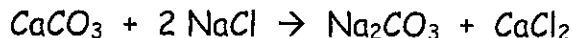
\_\_\_\_\_ is the study of quantity relationships in a chemical reaction. You are always given information about one substance in the reaction and asked for information about another substance. You "make the switch" between the two substances using the \_\_\_\_\_ ratio. When a reaction is carried out in a laboratory, the amount of product is called the \_\_\_\_\_ yield. The amount of product expected to be formed based on working the problem out mathematically is called the \_\_\_\_\_ yield. To calculate the \_\_\_\_\_ yield, you divide the \_\_\_\_\_ yield by the \_\_\_\_\_ yield, and then multiply by 100 percent. When looking at a chemical reaction, the reactant that runs out first is called the \_\_\_\_\_ reactant, and the reactant that has some left over is called the \_\_\_\_\_ reactant.

Part 2—problems SHOW ALL WORK!!

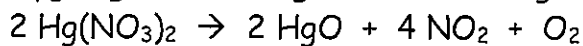
1. How many moles of potassium hydroxide are needed to completely react with 3.47 moles of aluminum sulfate according to the following BALANCED equation?



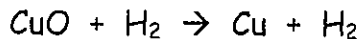
2. Calcium carbonate and sodium chloride react to produce sodium carbonate and calcium chloride according to the following BALANCED equation. How many moles of calcium chloride will be produced if 13.0 g of calcium carbonate are reacted?



3. When mercury (II) nitrate is heated, it decomposes to form mercury (II) oxide, nitrogen dioxide, and oxygen gas according to the following BALANCED equation.



- a. How many grams of mercury (II) oxide will be produced if 27.0 g of mercury (II) nitrate react?
- b. How many moles of oxygen gas will be produced if 3.5 g of nitrogen dioxide are produced?
- c. When 12.0 g of mercury (II) nitrate are decomposed in the lab, it is found that 7.56 g of mercury (II) oxide are produced. What is the actual yield, the theoretical yield, and the percent yield?
4. If 5.6 g of copper (II) oxide are reacted with 8.6 g of hydrogen according to the following BALANCED reaction, how many grams of copper metal will be produced?



The limiting reactant is \_\_\_\_\_, and the excess reactant is \_\_\_\_\_.

