

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

Due ☞ Test Day!

## Pretest: Unit 9 Stoichiometry

The following is an overview of the concepts, ideas, and problems we have covered in this unit. You are, however, responsible for all material covered, regardless if found here or not! Therefore, be sure to review all your notes, worksheets, assignments, handouts, readings, labs, problems, etc.. On the day of the test you will want to be well-acquainted with the material and organized, you will not want to waste time trying to understand an idea or searching for some needed information. Arrive prepared!

### Chapter 9

Be sure to read the chapter summary on Page 304 and understand all the vocabulary listed at the bottom of that page:

stoichiometry

mole ratio

mass-mass problems

limiting reactant

excess reactant

percent yield

actual yield

theoretical yield

All stoichiometry problems will require a balanced chemical equation and stoichiometric calculations!!

1.) Balance the chemical equation below then use it to answer the following question:



- a. How many moles of CO<sub>2</sub> can be produced from 4.5 moles of C<sub>2</sub>H<sub>2</sub>?
  
  
  
  
  
  
  
  
  
  
- b. How many grams of oxygen are needed to make 4.84 moles of water?
  
  
  
  
  
  
  
  
  
  
- c. How many grams of water will be produced from 3.0 moles of C<sub>2</sub>H<sub>2</sub>?
  
  
  
  
  
  
  
  
  
  
- d. If 3.5 grams of C<sub>2</sub>H<sub>2</sub> reacts in excess oxygen, how many grams of CO<sub>2</sub> will be produced?
  
  
  
  
  
  
  
  
  
  
- e. How many grams of carbon dioxide can be produced from 0.635 grams of oxygen?

2.) Upon heating, calcium carbonate decomposes to produce calcium oxide and carbon dioxide. Write a balanced chemical equation for this reaction:

a.) Determine the theoretical yield of  $\text{CO}_2$  if 235.0 g of  $\text{CaCO}_3$  reacts completely.

b.) What is the percent yield of  $\text{CO}_2$  if only 97.5 g of  $\text{CO}_2$  is actually collected?

3.) 230.0 grams of solid zinc metal is placed in 100.0 grams of hydrochloric acid.

a. Write a balanced chemical equation for this single-replacement reaction.

b. How many grams of hydrogen gas will be produced?

c. What is the limiting reactant? \_\_\_\_\_.

d. Which reactant is in excess and by how much?

4.) Aqueous solutions containing 10.0 grams of copper(II) nitrate and 10.0 grams of ammonium phosphate are mixed together.

a. Write a complete and balanced chemical equation for this double-replacement reaction.

b. How many grams of copper(II) phosphate will be produced? (Box correct answer!)

c. What is the limiting reactant?\_\_\_\_\_.

d. Which reactant is in excess and by how much?

5.) Chromium (III) oxide reacts with water and nitrogen to produce ammonium dichromate.

a. Write a complete and balanced chemical equation for this synthesis reaction.

b. How many grams of ammonium dichromate will be produced if 5.00 grams of the chromium (III) oxide is mixed with 5.00 grams of water and an excess of nitrogen? (Box your answer!)

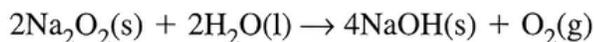
c. What is the limiting reactant?\_\_\_\_\_.

d. Which reactant is in excess and by how much?

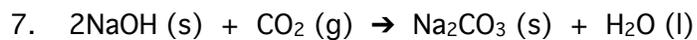
e. What is the percent yield of  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$  if only 7.15 g are produced?

6. Read the following passage and then solve the problems. In the equation that follows each problem, write in the space provided the mole ratio that can be used to solve the problem. Complete the equation by writing the correct value on the line provided.

The reaction of sodium peroxide and water produces sodium hydroxide and oxygen gas. The following balanced chemical equation represents the reaction.



- a. How many moles of sodium hydroxide are produced when 1.00 mol sodium peroxide reacts with water?
- 1.00 mol  $\text{Na}_2\text{O}_2$   $\times$  \_\_\_\_\_ = \_\_\_\_\_ mol NaOH
- b. How many moles of oxygen gas are produced when 0.500 mol  $\text{Na}_2\text{O}_2$  reacts with water?
- 0.500 mol  $\text{Na}_2\text{O}_2$   $\times$  \_\_\_\_\_ = \_\_\_\_\_ mol  $\text{O}_2$
- c. How many moles of sodium peroxide are needed to produce 1.00 mol sodium hydroxide?
- 1.00 mol NaOH  $\times$  \_\_\_\_\_ = \_\_\_\_\_ mol  $\text{Na}_2\text{O}_2$
- d. How many moles of water are required to produce 2.15 mol oxygen gas in this reaction?
- 2.15 mol  $\text{O}_2$   $\times$  \_\_\_\_\_ = \_\_\_\_\_ mol  $\text{H}_2\text{O}$
- e. How many moles of water are needed for 0.100 mol of sodium peroxide to react completely in this reaction?
- 0.100 mol  $\text{Na}_2\text{O}_2$   $\times$  \_\_\_\_\_ = \_\_\_\_\_ mol  $\text{H}_2\text{O}$
- f. How many moles of oxygen are produced if the reaction produces 0.600 mol sodium hydroxide?
- 0.600 mol NaOH  $\times$  \_\_\_\_\_ = \_\_\_\_\_ mol  $\text{O}_2$



How many moles of  $\text{Na}_2\text{CO}_3$  can be produced if 1.85 mol NaOH and 1.00 mol  $\text{CO}_2$  are allowed to react?

8. **Note: This is an alternate problem, different from what the other chemistry teachers gave.**  
1.246 g of a metal, A, reacts with HCl (aq) to form hydrogen gas and  $\text{ACl}_4$ . It is found that  $2.10 \times 10^{-2}$  moles of hydrogen forms. Calculate the atomic mass of the metal and give the chemical symbol. (Hint: the units of atomic mass are g/mol)

9. **Note: This is an alternate problem, different from what the other chemistry teachers gave.**  
Hydrogen combines with oxygen to produce water. If the yield for the reaction is 22.5%, how many grams of oxygen will have to be started in the reaction to yield 20.0 grams of water, assuming excess hydrogen? (Hint: use the formula for % yield and solve for theoretical yield)