

Instructions for Working out the Worksheets:

Work in groups of 4 on these problems. You should try to answer the questions without referring to your textbook. If you get stuck, try asking another group for help. Your TA will come around when needed to help guide you if needed.

Round Robin Instructions:

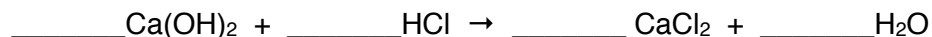
1. Each group member will be assigned a number, starting with #1 and ending with the number of people in the group.
2. Student #1 will read the question aloud and define the information needed to solve the problem, create an outline on how you can solve the problem.
3. When the group agrees that the necessary information is complete, student number two will do the first mathematical step. When the group agrees that the step is correct, student number three will do the next step. Continue this way until the group agrees that the given answer had been correctly converted to the wanted answer.
4. Student #2 will start the next question by reading it aloud as in #1. Follow this pattern for all the questions in the session.

Topics being Covered in the Worksheet:

1. Stoichiometry
2. Limiting Reactant
3. Percent Yield
4. Unit Conversion
5. Grams to Moles, Visa Versa

1-11 In the following problems you will be solving mathematical problems to help you understand topics 1-5. Make sure you have the correct significant figures for each problem.

1. Calcium hydroxide, used to neutralize acid spills, reacts with hydrochloric acid according to the following equation:



- (a) If you have spilled 6.3 mol of HCl and put 2.8 mol of Ca(OH)_2 on it, which substance is the limiting reactant? (Balance the equation first)

- (b) How many moles of the excess reactant remain?

2. Aluminum oxidizes according to the following equation:



(a) Powdered Al (0.048 mol) is placed into a container containing 0.030 mol O_2 . What is the limiting reactant? (Balance the equation first)

(b) How many moles of the excess reactant remain?

3. A process by which zirconium metal can be produced from the mineral zirconium (IV) orthosilicate, ZrSiO_4 , starts by reacting it with chlorine gas to form zirconium (IV) chloride.



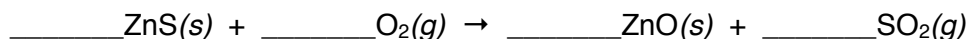
What mass of ZrCl_4 can be produced if 862 g of ZrSiO_4 and 950. g of Cl_2 are available? (Balance the equation first)

4. In the reaction:



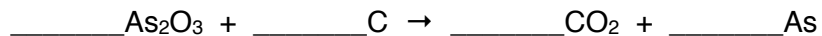
What mass of $\text{Ba}(\text{NO}_3)_2$ can be formed by combining 55 g of BaCO_3 and 26 g HNO_3 ? (Balance the equation first)

5. Huge quantities of sulfur dioxide are produced from zinc sulfide by means of the following reaction:



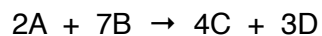
If the typical yield is 86.78%, how much SO_2 should be expected if 4897 g of ZnS are used? (Balance the equation first)

6. In the commercial production of the element arsenic, arsenic(III) oxide is heated with carbon, which reduced the oxide to the metal according to the following equation:



- (a) If 8.87 g of As_2O_3 is used in the reaction and 5.33 g of As is produced, what is the percent yield? (Balance the equation first)
- (b) If 67 g of carbon is used up in a different reaction and 425 g of As is produced, calculate the percent yield of this reaction?

7. Assume the following hypothetical reaction takes place:



Calculate the percent yield in each of the following cases:

(a) The reaction of 0.0251 mol of A produces 0.0349 mol of C.

(b) The reaction of 1.19 mol of A produces 1.41 mol of D.

(c) The reaction of 189 mol of B produces 39 mol of D.

(d) The reaction of 3500. mol of B produces 1700. mol of C.

8. Given the following reaction: (Balance the equation first)



(a) If you start with 14.8 g of C_3H_8 and 3.44 g of O_2 , determine the limiting reagent.

(b) Determine the number of moles of carbon dioxide produced.

(c) Determine the number of grams of dihydrogen monoxide produced.

9. How many grams of MgCl_2 will be produced from 12.0 g of Mg(OH)_2 and 42.0 g of HCl ? *Hint: Write a balanced equation and solve.*

10. Calculate the mass of magnesium oxide that will be produced if 2.40 g of magnesium reacts with 10.0 g of oxygen. *Hint: Write a balanced equation and solve.*

11. What is the mass of Br_2 if 76.4 g of $\text{C}_2\text{H}_3\text{Br}_3$ combusts with 49.1 g of oxygen? *Hint: Write a balanced equation and solve.*