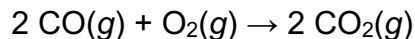


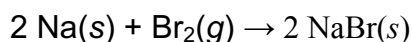
CH1020 Exercises (Worksheet 5 Solution)

1. A reaction vessel contains 10.0 g CO and 10.0 g O₂ which combine to form CO₂:



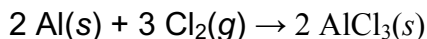
- a. Which reactant is the limiting reactant? **CO**
- b. How many grams of CO₂ could be produced? **15.7 g (theoretical yield)**
- c. How many grams of the non-limiting reactant are left over? **4.3 g O₂**

2. For the reaction below, determine the limiting reactant for each of the initial amounts of reactants.



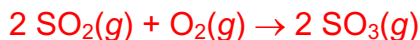
- a. 2 mol Na, 2 mol Br₂ **Na**
- b. 1.8 mol Na, 1.4 mol Br₂ **Na**
- c. 2.5 mol Na, 1 mol Br₂ **Br₂**
- d. 12.6 mol Na, 6.9 mol Br₂ **Na**

3. For the reaction shown, calculate the theoretical yield (in grams) for each initial amount of reactants



- a. 2.0 g Al; 2.0 g Cl₂ **Cl₂ limiting; 2.5 g AlCl₃**
- b. 7.5 g Al; 24.8 g Cl₂ **Cl₂ limiting; 31.1 g AlCl₃**
- c. 0.235 g Al; 1.15 g Cl₂ **Al limiting; 1.16 g AlCl₃**

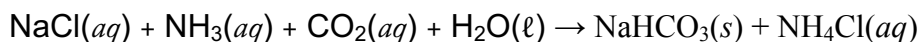
4. One reaction in the production of sulfuric acid involves the conversion of sulfur dioxide to sulfur trioxide. In the presence of excess O₂, 88 kg SO₂ produces 106 kg SO₃. What is the percent yield?



Theoretical yield is 110 kg SO_3

Yield: 96.4%

5. Baking soda (NaHCO_3) is produced on an industrial scale by the Solvay process. A key reaction in the process is



Suppose a reaction vessel initially contains 58.5 kg NaCl , 18.8 kg NH_3 , and excess CO_2 and H_2O . If 66 kg NaHCO_3 is produced, what is the percent yield?

NaCl is the limiting reagent; % yield $\text{NaHCO}_3 = 78\%$

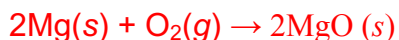
6. After you burn 4.62 mL of ethanol ($\text{C}_2\text{H}_5\text{OH}$, density, $\rho = 0.789 \text{ g mL}^{-1}$) in the presence of 15.5 g of oxygen gas, you collect 3.72 mL water (density, $\rho = 1.000 \text{ g mL}^{-1}$).
- Write the balance chemical reaction for the combustion of ethanol in an air ambient.
$$\text{C}_2\text{H}_5\text{OH} + 3 \text{O}_2 \longrightarrow 2 \text{CO}_2 + 3 \text{H}_2\text{O}$$
 - What's the limiting reactant in this reaction?

Ethanol
 - What's the theoretical yield of water?

0.237 mol or 4.28 g H_2O
 - What's the percent yield of water for this reaction?

87.0% yield

7. Magnesium oxide can be made by heating magnesium metal in the presence of oxygen. When 10.1 g of Mg reacts with 10.5 g O_2 , 11.9 MgO is collected. Determine the percent yield for the reaction.



Mg is the limiting reagent; theoretical yield 16.75 g MgO ; % yield = 71.0%