

12

STOICHIOMETRY

ANS RANGES

Practice Problems

In your notebook, solve the following problems.

SECTION 12.1 THE ARITHMETIC OF EQUATIONS

Use the 3-step problem-solving approach you learned in Chapter 1.

- An apple pie needs 10 large apples, 2 crusts (top and bottom), and 1 tablespoon of cinnamon. Write a balanced equation that fits this situation. How many apples are needed to make 25 pies? **15-20 mol O<sub>2</sub>**
- Two moles of potassium chloride and three moles of oxygen are produced from the decomposition of two moles of potassium chlorate, KClO<sub>3</sub>(s). Write the balanced equation. How many moles of oxygen are produced from 12 moles of potassium chlorate? **15-25 mol O<sub>2</sub>**
- Using the equation from problem 2, how many moles of oxygen are produced from 14 moles of potassium chlorate? **40-50 mol H<sub>2</sub>O**
- Two molecules of hydrogen react with one molecule of oxygen to produce two molecules of water. How many molecules of water are produced from 2.0 × 10<sup>23</sup> molecules of oxygen? How many moles of water are produced from 22.5 moles of oxygen?

SECTION 12.2 CHEMICAL CALCULATIONS

- Calculate the number of moles of hydrogen chloride produced from 10 moles of hydrogen.  
 $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$  **15-20 mol HCl**
- Calculate the number of moles of chlorine needed to form 14 moles of iron(III) chloride.  
 $2Fe(s) + 3Cl_2(g) \rightarrow 2FeCl_3(s)$  **15-25 mol Cl<sub>2</sub>**
- Calculate the number of grams of nitrogen dioxide that are produced from 4 moles of nitric oxide.  
 $2NO(g) + O_2(g) \rightarrow 2NO_2(g)$  **180-190 g NO<sub>2</sub>**
- Calculate the mass of oxygen produced from the decomposition of 75.0 g of potassium chlorate.  
 $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$  **25-35 g O<sub>2</sub>**
- Calculate the mass of silver needed to react with chlorine to produce 84 g of silver chloride. (Hint: Write a balanced equation first.) **60-70 g Ag**
- How many liters of carbon monoxide at STP are needed to react with 4.80 g of oxygen gas to produce carbon dioxide?  
 $2CO(g) + O_2(g) \rightarrow 2CO_2(g)$  **6-7 L CO**
- Calculate the number of liters of oxygen gas needed to produce 15.0 liters of dinitrogen trioxide. Assume all gases are at the same conditions of temperature and pressure.  
 $2N_2(g) + 3O_2(g) \rightarrow 2N_2O_3(g)$  **20-25 L O<sub>2</sub>**

- A volume of 7.5 L of hydrogen gas at STP was produced from the single-replacement reaction of zinc with nitric acid. Calculate the mass of zinc needed for this reaction. **20-25 g Zn**

SECTION 12.3 LIMITING REAGENT AND PERCENT YIELD

- How many moles of water can be made from 4 moles of oxygen gas and 16 moles of hydrogen gas? What is the limiting reagent? **5-10 mol H<sub>2</sub>O**
- Calculate the mass of water produced from the reaction of 24.0 g of H<sub>2</sub> and 160.0 g of O<sub>2</sub>. What is the limiting reagent? **150-200 g H<sub>2</sub>O**
- The burning of 18.0 g of carbon produces 55.0 g of carbon dioxide. What is the theoretical yield of CO<sub>2</sub>? Calculate the percent yield of CO<sub>2</sub>. **60-70 g CO<sub>2</sub>**
- Calculate the percent yield of Cl<sub>2</sub>(g) in the electrolytic decomposition of hydrogen chloride if 25.8 g of HCl produces 13.6 g of chlorine gas. **20-30 g Cl<sub>2</sub>**
- One method for reclaiming silver metal from silver chloride results in a 94.6% yield. Calculate the actual mass of silver that can be produced in this reaction if 100.0 g of silver chloride is converted to silver metal.  
 $2AgCl(s) \rightarrow 2Ag(s) + Cl_2(g)$  **70-74 g Ag**
- What is the actual amount of magnesium oxide produced when excess carbon dioxide reacts with 42.8 g of magnesium metal? The percent yield of MgO(s) for this reaction is 81.7%.  
 $2Mg(s) + CO_2(g) \rightarrow 2MgO(s) + C(s)$  **50-60 g MgO**