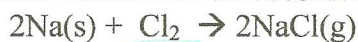


Limiting Reactant and Theoretical Yield Practice

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Box # \_\_\_\_\_

1. When 7.25mol of the Na reacts with 4.25mol of Cl<sub>2</sub> according to the following equation:

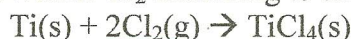


- a. What is the limiting reactant? Na  
 b. What is the theoretical yield of NaCl produced in moles? 7.25 mol NaCl

$$\frac{7.25 \text{ mol Na}}{1} \left( \frac{2 \text{ mol NaCl}}{2 \text{ mol Na}} \right) = \boxed{7.25 \text{ mol NaCl}} *$$

$$\frac{4.25 \text{ mol Cl}_2}{1} \left( \frac{2 \text{ mol NaCl}}{1 \text{ mol Cl}_2} \right) = 8.5 \text{ mol NaCl}$$

2. If 4.0mol of Ti is combined with 4.0mol Cl<sub>2</sub> according to the following equation:



- a. What is the limiting reactant? Cl<sub>2</sub>  
 b. What is the theoretical yield of TiCl<sub>4</sub> in moles? 2.0 mol TiCl<sub>4</sub>

$$\frac{4.0 \text{ mol Ti}}{1} \left( \frac{1 \text{ mol TiCl}_4}{1 \text{ mol Ti}} \right) = 4.0 \text{ mol TiCl}_4$$

$$\frac{4.0 \text{ mol Cl}_2}{1} \left( \frac{1 \text{ mol TiCl}_4}{2 \text{ mol Cl}_2} \right) = \boxed{2.0 \text{ mol TiCl}_4} *$$

3. If 4mol Mn reacts with 7mol O<sub>2</sub> according to the following equation:



- a. What is the limiting reactant? Mn  
 b. What is the theoretical yield of MnO<sub>2</sub> in grams? 347.7g MnO<sub>2</sub>

$$\frac{4 \text{ mol Mn}}{1} \left( \frac{1 \text{ mol MnO}_2}{1 \text{ mol Mn}} \right) \left( \frac{86.93 \text{ g MnO}_2}{1 \text{ mol MnO}_2} \right) = \boxed{347.72 \text{ g MnO}_2}$$

$$\frac{7 \text{ mol O}_2}{1} \left( \frac{1 \text{ mol MnO}_2}{1 \text{ mol O}_2} \right) \left( \frac{86.93 \text{ g MnO}_2}{1 \text{ mol MnO}_2} \right) = 608.51 \text{ g MnO}_2$$

4. If 100g of Cu are added to a solution, containing 100g of AgNO<sub>3</sub>:

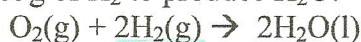


- a. What is the limiting reactant? AgNO<sub>3</sub>  
 b. What is the theoretical yield of Ag metal in grams? 63.50g Ag

$$\frac{100 \text{ g Cu}}{63.5 \text{ g Cu}} \left( \frac{1 \text{ mol Cu}}{1 \text{ mol Cu}} \right) \left( \frac{2 \text{ mol Ag}}{1 \text{ mol Cu}} \right) \left( \frac{107.9 \text{ g Ag}}{1 \text{ mol Ag}} \right) = 339.84 \text{ g Ag}$$

$$\frac{100 \text{ g AgNO}_3}{169.9 \text{ g AgNO}_3} \left( \frac{1 \text{ mol AgNO}_3}{169.9 \text{ g AgNO}_3} \right) \left( \frac{2 \text{ mol Ag}}{2 \text{ mol AgNO}_3} \right) \left( \frac{107.9 \text{ g Ag}}{1 \text{ mol Ag}} \right) = \boxed{63.50 \text{ g Ag}} *$$

5. When 1.22g of O<sub>2</sub> reacts with 1.05g of H<sub>2</sub> to produce H<sub>2</sub>O:



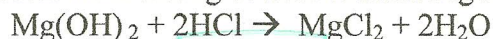
a. What is the limiting reactant? O<sub>2</sub>

b. What is the theoretical yield of H<sub>2</sub>O in grams? 1.37g H<sub>2</sub>O

$$\frac{1.22\text{g O}_2}{1} \left( \frac{1\text{mol O}_2}{32.0\text{g O}_2} \right) \left( \frac{2\text{mol H}_2\text{O}}{1\text{mol O}_2} \right) \left( \frac{18.02\text{g H}_2\text{O}}{1\text{mol H}_2\text{O}} \right) = \boxed{1.37\text{g H}_2\text{O}}^*$$

$$\frac{1.05\text{g H}_2}{1} \left( \frac{1\text{mol H}_2}{2.02\text{g H}_2} \right) \left( \frac{2\text{mol H}_2\text{O}}{2\text{mol H}_2} \right) \left( \frac{18.02\text{g H}_2\text{O}}{1\text{mol H}_2\text{O}} \right) = 9.37\text{g H}_2\text{O}$$

6. When 5.87g of Mg(OH)<sub>2</sub> reacts with 12.84g of HCl to form MgCl<sub>2</sub> and water.



a. What is the limiting reactant? MgCl<sub>2</sub>

b. What is the theoretical yield of MgCl<sub>2</sub> in grams? 9.58g MgCl<sub>2</sub>

$$\frac{5.87\text{g Mg}(\text{OH})_2}{1} \left( \frac{1\text{mol Mg}(\text{OH})_2}{58.33\text{g Mg}(\text{OH})_2} \right) \left( \frac{1\text{mol MgCl}_2}{1\text{mol Mg}(\text{OH})_2} \right) \left( \frac{95.21\text{g MgCl}_2}{1\text{mol MgCl}_2} \right) = \boxed{9.58\text{g MgCl}_2}^*$$

$$\frac{12.84\text{g HCl}}{1} \left( \frac{1\text{mol HCl}}{36.46\text{g HCl}} \right) \left( \frac{1\text{mol MgCl}_2}{2\text{mol HCl}} \right) \left( \frac{95.21\text{g MgCl}_2}{1\text{mol MgCl}_2} \right) = 16.76\text{g MgCl}_2$$

7. When 6.25g of AgNO<sub>3</sub> reacts with 4.12g of NaCl to form NaNO<sub>3</sub> and AgCl:



a. What is the limiting reactant? AgNO<sub>3</sub>

b. What is the theoretical yield of NaNO<sub>3</sub> in grams? 3.13g NaNO<sub>3</sub>

c. What is the theoretical yield of AgCl in grams? 5.27g AgCl

$$\frac{6.25\text{g AgNO}_3}{1} \left( \frac{1\text{mol AgNO}_3}{169.91\text{g AgNO}_3} \right) \left( \frac{1\text{mol NaNO}_3}{1\text{mol AgNO}_3} \right) \left( \frac{85\text{g NaNO}_3}{1\text{mol NaNO}_3} \right) = \boxed{3.13\text{g NaNO}_3}^*$$

$$\frac{4.12\text{g NaCl}}{1} \left( \frac{1\text{mol NaCl}}{58.44\text{g NaCl}} \right) \left( \frac{1\text{mol NaNO}_3}{1\text{mol NaCl}} \right) \left( \frac{85\text{g NaNO}_3}{1\text{mol NaNO}_3} \right) = 5.99\text{g NaNO}_3$$

$$\frac{6.25\text{g AgNO}_3}{1} \left( \frac{1\text{mol AgNO}_3}{169.91\text{g AgNO}_3} \right) \left( \frac{1\text{mol AgCl}}{1\text{mol AgNO}_3} \right) \left( \frac{143.35\text{g AgCl}}{1\text{mol AgCl}} \right) = \boxed{5.27\text{g AgCl}}^*$$

$$\frac{4.12\text{g NaCl}}{1} \left( \frac{1\text{mol NaCl}}{58.44\text{g NaCl}} \right) \left( \frac{1\text{mol AgCl}}{1\text{mol NaCl}} \right) \left( \frac{143.35\text{g AgCl}}{1\text{mol AgCl}} \right) = 10.11\text{g AgCl}$$

8. When 6.33g of H<sub>2</sub>SO<sub>4</sub> reacts with 5.92g of NaOH to produce NaSO<sub>4</sub> and water:



a. What is the limiting reactant? H<sub>2</sub>SO<sub>4</sub>

b. What is the theoretical yield of NaSO<sub>4</sub> in grams? 7.68g NaSO<sub>4</sub>

c. What is the theoretical yield of H<sub>2</sub>O in grams? 1.16g H<sub>2</sub>O

$$\frac{6.33\text{g H}_2\text{SO}_4}{1} \left( \frac{1\text{mol H}_2\text{SO}_4}{98.09\text{g H}_2\text{SO}_4} \right) \left( \frac{1\text{mol NaSO}_4}{1\text{mol H}_2\text{SO}_4} \right) \left( \frac{119.06\text{g NaSO}_4}{1\text{mol NaSO}_4} \right) = \boxed{7.68\text{g NaSO}_4}^*$$

$$\frac{5.92\text{g NaOH}}{1} \left( \frac{1\text{mol NaOH}}{40\text{g NaOH}} \right) \left( \frac{1\text{mol NaSO}_4}{1\text{mol NaOH}} \right) \left( \frac{119.06\text{g NaSO}_4}{1\text{mol NaSO}_4} \right) = 17.62\text{g NaSO}_4$$

$$\frac{6.33\text{g H}_2\text{SO}_4}{1} \left( \frac{1\text{mol H}_2\text{SO}_4}{98.09\text{g H}_2\text{SO}_4} \right) \left( \frac{1\text{mol H}_2\text{O}}{1\text{mol H}_2\text{SO}_4} \right) \left( \frac{18.02\text{g H}_2\text{O}}{1\text{mol H}_2\text{O}} \right) = \boxed{1.16\text{g H}_2\text{O}}^*$$