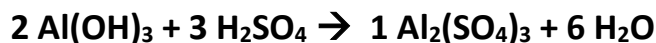


8. Determine the limiting reactant if you begin with 75.0 grams of each reactant.



$$\frac{75.0 \text{ g Al(OH)}_3}{1} \left| \frac{1 \text{ mole Al(OH)}_3}{78 \text{ g Al(OH)}_3} \right| \left| \frac{1 \text{ mole Al}_2(\text{SO}_4)_3}{2 \text{ mole Al(OH)}_3} \right| \left| \frac{342 \text{ g Al}_2(\text{SO}_4)_3}{1 \text{ mole Al}_2(\text{SO}_4)_3} \right| = 164 \text{ g Al}_2(\text{SO}_4)_3$$

Limiting Reactant

$$\frac{75.0 \text{ g H}_2\text{SO}_4}{1} \left| \frac{1 \text{ mole H}_2\text{SO}_4}{98 \text{ g H}_2\text{SO}_4} \right| \left| \frac{1 \text{ mole Al}_2(\text{SO}_4)_3}{3 \text{ mole H}_2\text{SO}_4} \right| \left| \frac{342 \text{ g Al}_2(\text{SO}_4)_3}{1 \text{ mole Al}_2(\text{SO}_4)_3} \right| = 87.2 \text{ g Al}_2(\text{SO}_4)_3$$

$$\frac{75.0 \text{ g Al(OH)}_3}{1} \left| \frac{1 \text{ mole Al(OH)}_3}{78 \text{ g Al(OH)}_3} \right| \left| \frac{6 \text{ mole H}_2\text{O}}{2 \text{ mole Al(OH)}_3} \right| \left| \frac{18 \text{ g H}_2\text{O}}{1 \text{ mole H}_2\text{O}} \right| = 51.9 \text{ g H}_2\text{O}$$

Limiting Reactant

$$\frac{75.0 \text{ g H}_2\text{SO}_4}{1} \left| \frac{1 \text{ mole H}_2\text{SO}_4}{98 \text{ g H}_2\text{SO}_4} \right| \left| \frac{6 \text{ mole H}_2\text{O}}{3 \text{ mole H}_2\text{SO}_4} \right| \left| \frac{18 \text{ g H}_2\text{O}}{1 \text{ mole H}_2\text{O}} \right| = 27.6 \text{ g H}_2\text{O}$$

9. What is the theoretical yield of the neutralization reaction above?

$$87.2 \text{ g Al}_2(\text{SO}_4)_3 \text{ or } 27.6 \text{ g H}_2\text{O}$$

10. A student performed this reaction in the lab and collected 66.3 grams of aluminum sulfate and 21.9 grams of water. Based on the theoretical yield you found in Problem #2, what is the student's percent yield?

$$\frac{66.3 \text{ g Al}_2(\text{SO}_4)_3}{87.2 \text{ g Al}_2(\text{SO}_4)_3} \times 100 = 76.0 \%$$

$$\frac{21.9 \text{ g H}_2\text{O}}{27.6 \text{ g H}_2\text{O}} \times 100 = 79.3 \%$$

Extra Credit: Calculate the amount of excess reactant leftover. (Worth 10 points)

$$\frac{75.0 \text{ g H}_2\text{SO}_4}{1} \left| \frac{1 \text{ mole H}_2\text{SO}_4}{98 \text{ g H}_2\text{SO}_4} \right| \left| \frac{2 \text{ mole Al(OH)}_3}{3 \text{ mole H}_2\text{SO}_4} \right| \left| \frac{78 \text{ g Al(OH)}_3}{1 \text{ mole Al(OH)}_3} \right| = 39.8 \text{ g Al(OH)}_3$$

$$75 \text{ grams Al(OH)}_3 - 39.8 \text{ grams Al(OH)}_3 = 35.2 \text{ grams Al(OH)}_3 \text{ leftover}$$