KEY

Percent, Actual, and Theoretical Yield

1) $LiOH + KCl \rightarrow LiCl + KOH$

a) I began this reaction with 20 grams of lithium hydroxide. What is my theoretical yield of lithium chloride?

$$\frac{20\text{ g LiOH}}{23.95\text{ g LiOH}} \left| \frac{\text{1 mol LiOH}}{\text{1 mol LiOH}} \right| \frac{\text{1 mol LiCl}}{\text{1 mol LiCl}} \left| \frac{42.39\text{ g LiCl}}{\text{1 mol LiCl}} \right. = 35.40\text{ g LiCl}$$

b) I actually produced 6 grams of lithium chloride. What is my percent yield?

$$\frac{6\text{ g LiCl}}{35.40\text{ g LiCl}} \times 100 = 16.9\%$$

2) $C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$

a) If I start with 5 grams of C_3H_8, what is my theoretical yield of water?

$$\frac{5\text{ g } C_3H_8}{44.11\text{ g } C_3H_8} \left| \frac{\text{1 mol } C_3H_8}{\text{1 mol } C_3H_8} \right| \frac{\text{4 mol } H_2O}{\text{1 mol } H_2O} \left| \frac{18.02\text{ g } H_2O}{\text{1 mol } H_2O} \right. = 8.17\text{ g } H_2O$$

b) I got a percent yield of 75% How many grams of water did I make?

$$(8.17\text{ g } H_2O)(.75) = 6.13\text{ g } H_2O$$

3) $Be + 2\ HCl \rightarrow BeCl_2 + H_2$

My theoretical yield of beryllium chloride was 10.7 grams. If my actual yield was 4.5 grams, what was my percent yield?

$$\%\text{yield} = \frac{4.5\text{ g}}{10.7\text{ g}} \times 100 = 42\%$$

4) $2\ NaCl + CaO \rightarrow CaCl_2 + Na_2O$

What is my theoretical yield of sodium oxide if I start with 20 grams of calcium oxide?

$$\frac{20\text{ g CaO}}{56.08\text{ g CaO}} \left| \frac{\text{1 mol CaO}}{\text{1 mol CaO}} \right| \frac{\text{1 mol } Na_2O}{\text{1 mol } Na_2O} \left| \frac{61.98\text{ g } Na_2O}{\text{1 mol } Na_2O} \right. = 22.10\text{ g } Na_2O$$

KEY

5) $FeBr_2 + 2\ KCl \rightarrow FeCl_2 + 2\ KBr$

a) What is my theoretical yield of iron (II) chloride if I start with 34 grams of iron (II) bromide?

$$\frac{34\text{ g } FeBr_2}{215.65\text{ g } FeBr_2} \left| \frac{1\text{ mol } FeBr_2}{1\text{ mol } FeBr_2} \right| \frac{1\text{ mol } FeCl_2}{1\text{ mol } FeCl_2} \left| \frac{126.75\text{ g } FeCl_2}{1\text{ mol } FeCl_2} \right| = \boxed{19.98\text{ g } FeCl_2}$$

b) What is my percent yield of iron (II) chloride if my actual yield is 4 grams?

$$\frac{4\text{ g } FeCl_2}{19.98\text{ g } FeCl_2} \times 100 = \boxed{20\%}$$

6) $TiS + H_2O \rightarrow H_2S + TiO$

What is my percent yield of titanium (II) oxide if I start with 20 grams of titanium (II) sulfide and my actual yield of titanium (II) oxide is 22 grams?

$$\frac{20\text{ g } TiS}{79.95\text{ g } TiS} \left| \frac{1\text{ mol } TiS}{1\text{ mol } TiS} \right| \frac{1\text{ mol } TiO}{1\text{ mol } TiO} \left| \frac{63.88\text{ g } TiO}{1\text{ mol } TiO} \right| = 15.98\text{ g } TiO$$

$$\frac{22\text{ g } TiO}{15.98\text{ g } TiO} \times 100 = \boxed{137.7\% \Rightarrow \text{NOT POSSIBLE}}$$

7) $U + 3\ Br_2 \rightarrow UBr_6$

What is my actual yield of uranium hexabromide if I start with 100 grams of uranium and get a percent yield of 83% ?

$$\frac{100\text{ g } U}{238.03\text{ g } U} \left| \frac{1\text{ mol } U}{1\text{ mol } U} \right| \frac{1\text{ mol } UBr_6}{1\text{ mol } UBr_6} \left| \frac{717.43\text{ g } UBr_6}{1\text{ mol } UBr_6} \right| = 301.4\text{ g } UBr_6$$

$$(301.4\text{ g } UBr_6)(.83) = \boxed{250.16\text{ g } UBr_6}$$

8) $H_2SO_4 \rightarrow H_2O + SO_3$

If I start with 89 grams of sulfuric acid and produce 7.1 grams of water, what is my percent yield?

$$\frac{89\text{ g } H_2SO_4}{98.09\text{ g } H_2SO_4} \left| \frac{1\text{ mol } H_2SO_4}{1\text{ mol } H_2SO_4} \right| \frac{1\text{ mol } H_2O}{1\text{ mol } H_2O} \left| \frac{18.02\text{ g } H_2O}{1\text{ mol } H_2O} \right| = 16.35\text{ g } H_2O$$

$$\frac{7.1\text{ g } H_2O}{16.35\text{ g } H_2O} \times 100 = \boxed{43.4\%}$$