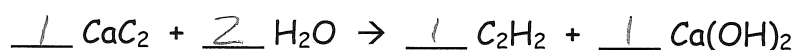


Honors Chemistry Stoichiometry Practice with Yield

Calculate the theoretical yield and the percent yield for each problem. Use periodic table average masses rounded to hundredths (.01). Box your answers and show your work.

- 1) Balance the following equation for the production of acetylene gas. What is the theoretical yield for acetylene if 5.251 g of calcium carbide (CaC_2) was combined with water? The actual amount of acetylene collected was 2.110g. What was the percent yield?



$$\frac{5.251 \text{ g CaC}_2}{64.10 \text{ g}} \times \frac{1 \text{ mol CaC}_2}{1 \text{ mol C}_2\text{H}_2} \times \frac{26.04 \text{ g}}{1 \text{ mol C}_2\text{H}_2} = \boxed{2.133 \text{ g C}_2\text{H}_2}$$

$$\frac{2.110 \text{ g}}{2.132 \text{ g}} \times 100 = \boxed{98.92\% \text{ yield C}_2\text{H}_2}$$

- 2) Combustion of 35.00 grams of propane produces theoretically yields how much water? 40.25g of water was captured after combustion stopped, what was the percent yield.



$$\frac{35.00 \text{ g C}_3\text{H}_8}{44.11 \text{ g}} \times \frac{1 \text{ mol C}_3\text{H}_8}{4 \text{ mol H}_2\text{O}} \times \frac{18.02 \text{ g}}{1 \text{ mol H}_2\text{O}} = \boxed{57.19 \text{ g H}_2\text{O}}$$

$$\begin{array}{l} \text{Actual} \rightarrow 40.25 \text{ g} \\ \text{Theor} \rightarrow 57.19 \text{ g} \end{array} \times 100 = \boxed{70.38\% \text{ Yield H}_2\text{O}}$$

CO₂
12.01
32.00
44.01



- 3) 35.01 g of sodium hydroxide reacts with 25.00 g of carbon dioxide to produce sodium carbonate and water, how many grams of water can be theoretically formed? Is there any excess reactant (yes or no)? If yes, how much? 6.125 g of water is collected after the reaction has gone to completion, what is the percent yield?

$$35.01 \text{ g NaOH} / \frac{40.00 \text{ g}}{1 \text{ mol}} \times \frac{1 \text{ mol H}_2\text{O}}{2 \text{ mol NaOH}} \times \frac{18.02 \text{ g}}{1 \text{ mol}} = 7.886 \text{ g H}_2\text{O}$$

$$25.00 \text{ g CO}_2 / \frac{44.01 \text{ g}}{1 \text{ mol}} \times \frac{1 \text{ mol H}_2\text{O}}{1 \text{ mol CO}_2} \times \frac{18.02 \text{ g}}{1 \text{ mol}} = 10.24 \text{ g H}_2\text{O}$$

yes CO₂

$$35.01 \text{ g NaOH} / \frac{40.00 \text{ g}}{1 \text{ mol}} \times \frac{1 \text{ mol CO}_2}{2 \text{ mol NaOH}} \times \frac{44.01 \text{ g}}{1 \text{ mol}} = 19.26 \text{ g CO}_2$$

25.00 g CO₂ excess
19.26 g CO₂

- 4) 3.21 grams of calcium hydroxide is combined with 150.00 mL of 1.350 M HCl.

What is the theoretical yield of calcium chloride for this reaction? Is there any excess reactant (yes or no)? If yes, how much? 3.561 grams of calcium chloride was collected after this reaction was completed. What was the percent yield?



$$3.21 \text{ g Ca(OH)}_2 / \frac{74.10 \text{ g}}{1 \text{ mol}} \times \frac{1 \text{ mol CaCl}_2}{1 \text{ mol Ca(OH)}_2} \times \frac{110.98 \text{ g}}{1 \text{ mol}} = 4.81 \text{ g CaCl}_2$$

$$150.00 \text{ L HCl} / \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1.350 \text{ mol}}{1 \text{ L}} \times \frac{1 \text{ mol CaCl}_2}{2 \text{ mol HCl}} \times \frac{110.98 \text{ g}}{1 \text{ mol}} = 11.24 \text{ g CaCl}_2$$

yes HCl

$$3.21 \text{ g Ca(OH)}_2 / \frac{74.10 \text{ g}}{1 \text{ mol}} \times \frac{2 \text{ mol HCl}}{1 \text{ mol Ca(OH)}_2} = 0.866 \text{ mol HCl}$$

$$\frac{3.561}{4.81} \times 100 = 74.0\% \text{ yield CaCl}_2$$

$$150.00 \text{ L HCl} / \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1.350 \text{ mol}}{1 \text{ L}} = 2.025 \text{ mol HCl}$$

Bonus: If there was HCl left what would be the molarity of the solution? Don't forget that some more water is produced by the reaction!

$$0.1159 \text{ mol HCl}$$

$$0.15456 \text{ L}$$

$$0.7647 \text{ M HCl}$$

$$3.21 \text{ g Ca(OH)}_2 / \frac{74.10 \text{ g}}{1 \text{ mol}} \times \frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol Ca(OH)}_2} \times \frac{18.02 \text{ g}}{1 \text{ mol}} = 1.361 \text{ mol H}_2\text{O}$$