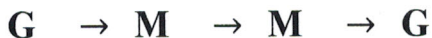


Name: SOLUTIONS

Chem B Unit 7, Day 6: Yields

Date: _____ Hour: _____



Bellwork:

When 1.2 grams of magnesium metal is dropped into 0.1 mol of hydrochloric acid, how much magnesium chloride is produced?



(2) LR problem b/c 2 amounts of reactants given. Need to do 2 calculations

$$\frac{1.2 \text{ g Mg} \mid 1 \text{ mol Mg} \mid 1 \text{ mol MgCl}_2 \mid 95.2 \text{ g MgCl}_2}{24.3 \text{ g Mg} \mid 1 \text{ mol Mg} \mid 1 \text{ mol MgCl}_2} = 4.7 \text{ g MgCl}_2$$

Vocab and tools:

$$\frac{0.1 \text{ mol HCl} \mid 1 \text{ mol MgCl}_2 \mid 95.2 \text{ g MgCl}_2}{2 \text{ mol HCl} \mid 1 \text{ mol MgCl}_2} = 4.7 \text{ g MgCl}_2$$

Your description based on the video

Your chemistry description both reactants will run

Theoretical yield ~ 450	How many people should be able to be served cake based on the caterer's calculations	The amount of product we expect to get from a reaction <u>GIVEN THE MATH!</u>	at the Sav time
Actual yield ~ 3	How many people <u>actually</u> got cake after the catastrophe!	The amount of product we actually get from the experiment	The 4.7 will be p

Always smaller (or equal to) theoretical yield.

Example problem:

ex. You can get ~~100~~ on a test (TY), but if you score a 90,

An experimental procedure asks you to react 15.5 g of NH_4Cl with an excess of $AgNO_3$. In the reaction 35.5 g $AgCl$ is produced. What is the percent yield? then your AY is 90 (less than TY)

"Actual yield"



Use this to determine the theoretical yield of $AgCl$ given this starting amount of NH_4Cl - how much can we make?

Percent yield: $\frac{\text{Mass of actual yield}}{\text{Mass of theoretical yield}} \times 100\%$

Percent error: $\frac{|\text{theoretical yield} - \text{actual yield}|}{\text{theoretical yield}} \times 100\%$

(1) TY: $\frac{15.5 \text{ g } NH_4Cl \mid 1 \text{ mol } NH_4Cl \mid 1 \text{ mol } AgCl \mid 143.32 \text{ g } AgCl}{53.49 \text{ g } NH_4Cl \mid 1 \text{ mol } NH_4Cl \mid 1 \text{ mol } AgCl} = 41.5 \text{ g } AgCl$

(2) Percent yield = $\frac{AY}{TY} \times 100\% = \frac{35.5 \text{ g } AgCl}{41.5 \text{ g } AgCl} \times 100\% = \boxed{85.5\%}$
(how close were we?)

1. Given a hydrogen fuel cell reaction where 11.3 grams of water are expected to be released (labeled TY) what is the percent yield if the fuel cell actually releases 8.44 g of water (labeled AY)? What is the percent error?

$$\begin{aligned} \text{TY: } & 11.3 \text{ g H}_2\text{O} \\ \text{AY: } & 8.44 \text{ g H}_2\text{O} \end{aligned}$$

$$\text{Percent yield: } \frac{\text{AY}}{\text{TY}} \times 100\% = \frac{8.44 \text{ g H}_2\text{O}}{11.3 \text{ g H}_2\text{O}} \times 100\% = 75\%$$

$$\text{Percent error: } \frac{|\text{TY} - \text{AY}|}{\text{TY}} \times 100\% = \frac{|11.3 \text{ g} - 8.44 \text{ g}|}{11.3 \text{ g}} \times 100\% = 25\%$$

2. In the decomposition reaction of calcium carbonate, CaCO_3 , if 20.7 grams of CaCO_3 produces 6.81 grams of CaO , what is the percent yield? (labeled AY)



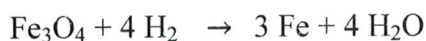
b. Theoretical yield of CaO given that 20.7 g CaCO_3 was used: 11.6 g CaO

$$\text{TY: } \frac{20.7 \text{ g CaCO}_3}{100.09 \text{ g CaCO}_3} \times \frac{1 \text{ mol CaCO}_3}{1 \text{ mol CaCO}_3} \times \frac{1 \text{ mol CaO}}{1 \text{ mol CaCO}_3} \times \frac{56.08 \text{ g CaO}}{1 \text{ mol CaO}} = 11.6 \text{ g CaO}$$

c. Percent yield of CaO : 58.7%

$$\text{Percent yield: } \frac{\text{AY}}{\text{TY}} \times 100\% = \frac{6.81 \text{ g CaO}}{11.6 \text{ g CaO}} \times 100\% = 58.7\%$$

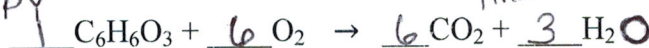
3. For the balanced equation shown below, if the reaction uses 0.112 grams of Fe_3O_4 and actually produces 0.059 grams of Fe , what is the percent yield of Fe ? (labeled AY)



(1) TY of Fe : $\frac{0.112 \text{ g Fe}_3\text{O}_4}{231.54 \text{ g Fe}_3\text{O}_4} \times \frac{1 \text{ mol Fe}_3\text{O}_4}{1 \text{ mol Fe}_3\text{O}_4} \times \frac{3 \text{ mol Fe}}{1 \text{ mol Fe}_3\text{O}_4} \times \frac{55.85 \text{ g Fe}}{1 \text{ mol Fe}} = 0.081 \text{ g Fe}$

(2) Percent yield: $\frac{\text{AY}}{\text{TY}} \times 100\% = \frac{0.059 \text{ g Fe}}{0.081 \text{ g Fe}} \times 100\% = 72.8\% \text{ yield}$

4. How many grams of H_2O are produced from burning 40.8 grams of $\text{C}_6\text{H}_6\text{O}_3$ in the presence of oxygen, given that 39.0% yield is obtained? (labeled AY)



(1) Question is different - wants us to determine AY from PY & TY

(2) TY: $\frac{40.8 \text{ g C}_6\text{H}_6\text{O}_3}{126.11 \text{ g C}_6\text{H}_6\text{O}_3} \times \frac{1 \text{ mol C}_6\text{H}_6\text{O}_3}{1 \text{ mol C}_6\text{H}_6\text{O}_3} \times \frac{3 \text{ mol H}_2\text{O}}{1 \text{ mol C}_6\text{H}_6\text{O}_3} \times \frac{18.0152 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 17.48 \text{ g H}_2\text{O}$

(3) $\text{PY} = \frac{\text{AY}}{\text{TY}} \rightarrow \text{AY} = \text{PY} \cdot \text{TY} = (0.390)(17.48 \text{ g H}_2\text{O}) = 6.82 \text{ g H}_2\text{O}$ (were actually produced)