

## Percent Yield



## Stoichiometry

- Stoichiometry gives you a theoretical yield.
- Theoretical, in this case, is the layman's definition of a hypothesis.
- It is an "educated guess" as to how much should be produced or would be needed to produce a certain amount.



## But not exactly

- For stoichiometry to actually work, you would need almost every single atom/molecule of reactant to react with each other.
- That is unlikely.
- Odds are there will be some atoms/molecules of limiting reactant that just can't "find" the other reactant.



## Lost

- Also some product is likely to be "lost".
- Not destroyed but literally lost.
- Either spilled onto the floor, stuck to a stirring rod, or turned into a gas, or ...



## Therefore...

- Our actual yield, what we really get, should be less than our theoretical yield, what we assumed we would get.
- Percent yield is the comparison of actual yield to theoretical yield.



## Not always

- It is possible to get a percent yield that is higher than 100%.
- It just tells you that there was some form of error in the lab or that some containment is present in your product.



## Percent Yield

- You can calculate Percent Yield by the equation
- $\frac{\text{Actual Yield}}{\text{Theoretical Yield}} \times 100$
- Some can be performed at near 100% yield, others you are lucky to get 50%



## Problems

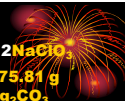
- $\text{AgClO}_3 + \text{Na}_2\text{CO}_3 \rightarrow \text{Ag}_2\text{CO}_3 + \text{NaClO}_3$
- How much silver (I) carbonate is produced by mixing 325 g of silver (I) chlorate with 120 grams of sodium carbonate, if the reaction has 75.0% yield?



## Answer

•  $2\text{AgClO}_3 + \text{Na}_2\text{CO}_3 \rightarrow \text{Ag}_2\text{CO}_3 + 2\text{NaClO}_3$

325 g	1 mol	1 mol	275.81 g
$\text{AgClO}_3$	$\text{AgClO}_3$	$\text{Ag}_2\text{CO}_3$	$\text{Ag}_2\text{CO}_3$
	191.35 g	2 mol	1 mol
	$\text{AgClO}_3$	$\text{AgClO}_3$	$\text{Ag}_2\text{CO}_3$
			234 g $\text{Ag}_2\text{CO}_3$
120 g	1 mol	1 mol	275.81 g
$\text{Na}_2\text{CO}_3$	$\text{Na}_2\text{CO}_3$	$\text{Ag}_2\text{CO}_3$	$\text{Ag}_2\text{CO}_3$
	105.99 g	1 mol	1 mol $\text{Ag}_2\text{CO}_3$
	$\text{Na}_2\text{CO}_3$	$\text{Na}_2\text{CO}_3$	312 g $\text{Ag}_2\text{CO}_3$



### Still Going

- Percent yield =  $\frac{\text{actual yield}}{\text{theoretical}} \times 100$
- $.75 = \text{actual} / 234.225 \dots \text{g}$
- Actual Yield = 176 g  $\text{Ag}_2\text{CO}_3$

### Another



- If you react 62.5 g of hydrofluoric acid with 92.0 g of tin and you produce 109 g of tin (II) fluoride, what was your percent yield?

### Answer

• $\text{Sn} + 2 \text{HF} \rightarrow \text{SnF}_2 + \text{H}_2$			
62.5 g HF	1 mol HF	1 mol SnF <sub>2</sub>	156.7 g SnF <sub>2</sub>
	20.008 g HF	2 mol HF	1 mol SnF <sub>2</sub> 245 g SnF <sub>2</sub>
92.0 g Sn	1 mol Sn	1 mol SnF <sub>2</sub>	156.7 g SnF <sub>2</sub>
	118.7 g Sn	1 mol Sn	1 mol SnF <sub>2</sub> 121 g SnF <sub>2</sub>

### Finishing

- Percent yield =  $\frac{\text{actual yield}}{\text{theoretical}} \times 100$
- $109 \text{ g} / 121.45 \dots \text{g} \times 100 =$
- 89.7 %