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

- $AgClO_3 + Na_2CO_3 \rightarrow Ag_2CO_3 + NaClO_3$
- 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

- $2AgClO_3 + Na_2CO_3 \rightarrow Ag_2CO_3 + 2NaClO_3$

325 g $AgClO_3$	1 mol $AgClO_3$	1 mol Ag_2CO_3	275.81 g Ag_2CO_3
	191.35 g $AgClO_3$	2 mol $AgClO_3$	1 mol Ag_2CO_3
			234 g Ag_2CO_3

120 g Na_2CO_3	1 mol Na_2CO_3	1 mol Ag_2CO_3	275.81 g Ag_2CO_3
	105.99 g Na_2CO_3	1 mol Na_2CO_3	1 mol Ag_2CO_3
			312 g Ag_2CO_3

Still Going

- Percent yield = $\frac{\text{actual yield}}{\text{theoretical}}$ x 100
- .75 = actual /234.225...g
- Actual Yield = 176 g Ag_2CO_3

Another

$Sn + HF \rightarrow SnF_2 + H_2$

- 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

- $Sn + 2\ HF \rightarrow SnF_2 + H_2$

62.5 g HF	1 mol HF	1 mol SnF_2	156.7 g SnF_2
	20.008 g HF	2 mol HF	1 mol SnF_2
			245 g SnF_2
92.0 g Sn	1 mol Sn	1 mol SnF_2	156.7 g SnF_2
	118.7 g Sn	1 mol Sn	1 mol SnF_2
			121 g SnF_2

Finishing

- Percent yield = $\frac{\text{actual yield}}{\text{theoretical}}$ x 100
- 109 g / 121.45... g x100 =
- 89.7 %