Percent Yield

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Yields in Chemistry

- ***Theoretical Yield*** – The maximum amount of product that can be produced from a given amount of reactant.
- ***Actual Yield*** – The measured amount of product actually obtained from the reaction process.
- ***Percent Yield*** – The ratio of the actual yield to the theoretical yield.

$$percent\ yield = \frac{actual\ yield}{theoritical\ yield}\ x\ 100$$

Theoretical Yield

- Methanol can be produced through the reaction of CO and H_2 in the presence of a catalyst.

$$1CO_{(g)} + 2H_{2(g)} \rightarrow 1CH_3OH_{(g)}$$

- 75.0 g of CO react with excess H_2 to form CH_3OH, what is the theoretical yield of methanol you expect to form?

75.0 g CO

- So we expect to form 83.1 g of methanol in this reaction, that is our theoretical yield.

Actual Yield

- Our ***theoretical yield*** was that we expected to form 83.1 g of methanol in this reaction.
- During the reaction:
  - Reactants could combine in proportions different from the precise proportions required for a complete reaction.
  - There may be other side reactions not shown in the balanced equation.
  - Some reactions may be reversible so you may be going back to the reactant substances.
  - The product formed may be impure, and some may be lost during the purification process.
  - Dirty equipment may lead to loss of reactant before the reaction or loss of product after.
  - Errors in measurement or calculation by the experimenter.

Actual Yield

- Our ***theoretical yield*** was that we expected to form 83.1 g of methanol in this reaction.
- During the reaction, something caused us to not make as much as we should have made.
- Our ***actual yield*** (what we created) was only 68.4 grams of methanol.

Percent Yield

- What we hoped to get (83.1 g) THEORITICAL
- What we actually got (68.4 g)
- Our percent yield was:

$$percent\ yield = \frac{actual\ yield}{theoritical\ yield}\ x\ 100$$