

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.

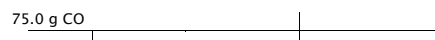
$$\text{percent yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$$

Theoretical Yield

- ▶ Methanol can be produced through the reaction of CO and H₂ in the presence of a catalyst.

$$1 \text{CO}_{(g)} + 2 \text{H}_{2(g)} \rightarrow 1 \text{CH}_3\text{OH}_{(g)}$$
- ▶ 75.0 g of CO react with excess H₂ to form CH₃OH, 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) THEORETICAL
- ▶ What we actually got (68.4 g)
- ▶ Our percent yield was:

$$\text{percent yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$$