Percent Yields from Reactions

- **Theoretical yield** is calculated by assuming that the reaction goes to completion.
- **Actual yield** is the amount of a specified pure product made in a given reaction.
  - In the laboratory, this is the amount of product that is formed in your beaker, after it is purified and dried.
- **Percent yield** indicates how much of the product is obtained from a reaction.

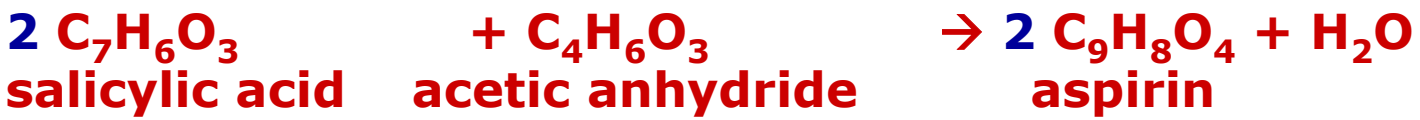
$$\text{percent yield} = \frac{\text{actual yield of product}}{\text{theoretical yield of product}} \times 100\%$$

$$CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O$$

A 10.0 g sample of ethanol, C_2H_5OH, was boiled with excess acetic acid, CH_3COOH, to produce 14.8 g of ethyl acetate, $CH_3COOC_2H_5$. What is the percent yield?

$C_6H_6 + HNO_3 \rightarrow C_6H_5NO_2$

- Example 3-11, **P.100**. A 15.6-g sample of C_6H_6 is mixed with excess HNO_3. We isolate 18.0 g of $C_6H_5NO_2$. What is the percent yield of $C_6H_5NO_2$ in this reaction?



- Salicylic acid reacts with acetic anhydride to form aspirin, acetylsalicylic acid. If the percent yield in this reaction is 78.5%, what mass of salicylic acid is required to produce 150. g aspirin?

Concentration of Solutions

- **The concentration of a solution defines the amount of *solute dissolved in the solvent*.**
  - **The amount of sugar in sweet tea can be defined by its concentration.**

Concentrations of Solutions

Molarity (M): number of moles of a solute dissolved in one liter of solution, Moles/Liter

$$\text{molarity} = \frac{\text{number of moles of solute}}{\text{number of liters of solution}}$$

Take-Home Calculations

- $(M \times V)_A = (M \times V)_B$

- $M \times V$ = moles of solute
- $M \times V$ = W/MW
- $(M \times V)_A = (W/MW)_A$

  OR

- $(M \times V)_A = (W/MW)_B$
- $W = M \times V \times MW$

$KOH + HCl \rightarrow KCl + H_2O$

- What is the **molarity** of a KOH solution if 38.7 mL of the KOH solution is required to react with 43.2 mL of 0.223 M HCl?

Concentrations of Solutions

- Calculate the **molarity** of a solution that contains 12.5 g of sulfuric acid in 1.75 L of solution.

Concentrations of Solutions

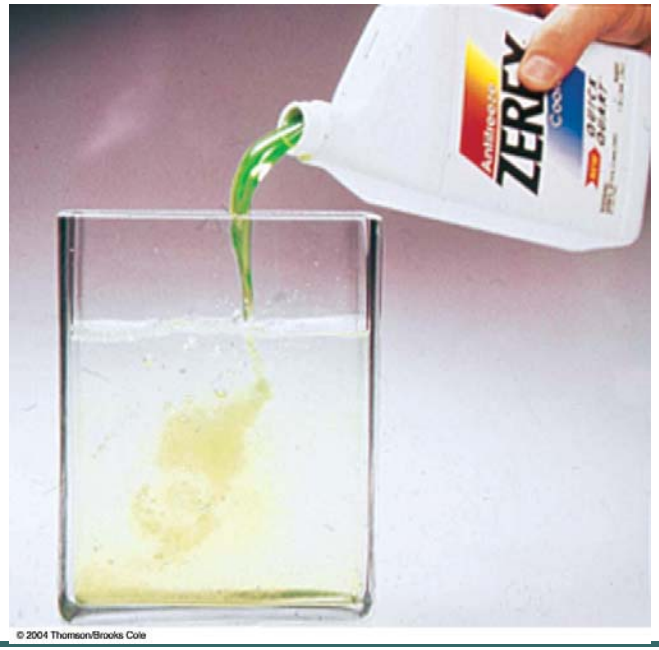
- Determine the **mass** of calcium nitrate required to prepare 3.50 L of 0.800 M $Ca(NO_3)_2$.

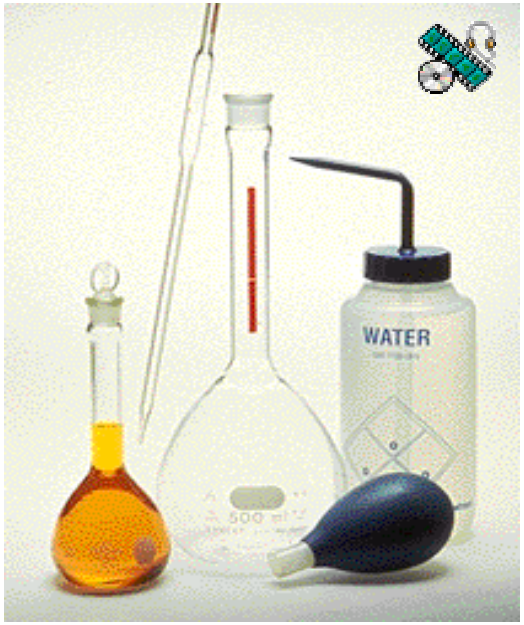
$$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2\ NaCl$$

- What **volume** of 0.500 M $BaCl_2$ is required to completely react with 4.32 g of Na_2SO_4?

Dilution of Solutions

- **Common method to dilute a solution involves the use of volumetric flask, pipette, and suction bulb.**





Dilution of Solutions

- To dilute a solution, add solvent to a concentrated solution.
  - One method to make tea “less sweet.”
  - How fountain drinks are made from syrup.

- $\mathbf{(M_1V_1)_{before\ dilution} = (M_2V_2)_{after\ dilution}}$

Dilution of Solutions

- If 10.0 mL of 12.0 M HCl is added to enough water to give 100. mL of solution, what is the **concentration** of the solution?

Dilution of Solutions

- What **volume** of 18.0 M sulfuric acid is required to make 2.50 L of a 2.40 M sulfuric acid solution?