Plan: → 4.5/SoLn Conc. → 4.6/Grammetry → More Redox

**Concentration**

- Vinaoge is acetic acid, a weak acid
  - (weak electrolyte)
  - → dangerous? not really
- Glacial acetic acid
  - Fumes when you open it, corrosive
  - → it is more concentrated

**Reason for conc.**?

- We will use Molarity (M) = \( \frac{\text{moles solute}}{\text{Liter of Soln}} \), expressed as
  \[ [\text{CH}_3\text{COOH}] = 17.4 M \]

**For lab**
- Mass solute \( \times \frac{1}{\text{MW solute}} = \) moles solute
- Put into "volumetric flask" and add H2O until fill

**Dilution**
- To make soln less conc. (glacial → vinaoge)

\[ \begin{align*}
17.4 M \\
\text{conc} 500 mL \\
\text{pipette} 25 mL \\
\text{250 mL} \\
\end{align*} \]
What is new conc?

\[ 25 \text{ mL} \cdot \frac{1 \text{ L}}{1000 \text{ mL}} \cdot \left( \frac{17.4 \text{ mol}}{L} \right) = 0.435 \text{ mol CH}_3\text{COOH} \]

\[ \text{step} \ 1/2 \ \text{ voluem} \]

New volume is 250 mL:

\[ \frac{0.435 \text{ mol}}{0.250 \text{ L}} = 1.74 \text{ M} \]

\( \left( \frac{1}{10} \text{th of original conc} \right) \)

Factor: \[ 17.4 \text{ M} \cdot \left( \frac{25 \text{ mL}}{250 \text{ mL}} \right) = 1.74 \text{ M} \]

The dilution eqn:

\[ M_1V_1 = M_2V_2 \]

\[ M_2 = M_1 \cdot \frac{V_1}{V_2} \]

Memorize & master 1 of these
We will do it in laboratory week!!

- Idea: selectively precipitate one ion, measure its mass
- Use precip agent that maximizes yield
  but doesn't stick
- Must account for mass of precip ion
- Use XS precip agent

Given unknown soln. of chloride, precip using AgCl

\[
\begin{align*}
2.8632 \text{ g AgCl} &\rightarrow \text{if solution was 50.00 mL and 2.8632 g were precipitated, what was the conc. Cl}^-?

(2.8632 \text{ g AgCl})(\frac{1 \text{ moL AgCl}}{143.32 \text{ g AgCl}})(\frac{1 \text{ mol Cl}^-}{1 \text{ mol AgCl}})(\frac{1}{0.05000 \text{ L}}) \\
&= 0.39955 \text{ moL/L} \\
\text{4 s.f.} &\rightarrow 0.3996 \text{ M Cl}^-
\end{align*}
\]

Back to REDOX
\[ \text{K}_2\text{S}_2\text{O}_3 + \text{H}_2\text{O} \rightarrow 2\text{KHSO}_4 + 8\text{e}^- + 8\text{H}^+ \]

Half Reaction:

Easy:

\[ \text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^- \]  \( \times 4 \)

Longer:

\[ \text{K}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O} \rightarrow 2\text{KHSO}_4 + 8\text{e}^- + 8\text{H}^+ \]

\[ 4\text{Cl}_2 + 8\text{e}^- \rightarrow 8\text{Cl}^- \]

\[ \text{K}_2\text{S}_2\text{O}_3 + 4\text{Cl}_2 + 5\text{H}_2\text{O} \rightarrow 8\text{HCl} + 2\text{KHSO}_4 \]
Metal Activity Series

Strongest Metal: Li

Weakest Metal Ion (won’t react): react with H₂O

Na

Magnesium (Mg)

Zn

Fe

Pb

H

Ca

Hg

Ag

Pt

Au

Weakest Metal

Strongest Ion

→ Strong metal means most reactive metal/neutral element

→ Strong ion means most reactive ion → wants to react to be neutral