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Generating and Using a Calibration Graph

Using your Calibration Graph!

Now for the fun part! Using the calibration plot that YOU made from the data two pages ago. We are going to determine the concentration of an unknown solution. Make sure you have your plot ready, because here we go!

Here's a typical problem. You take 3mL of your unknown sample and 7mL water and mix them together. The diluted sample gives an absorbance of 0.432. What is the concentration of the initial unknown?

Where do you begin?! Well, you have your calibration graph, and it SHOULD look something like this, all properly labeled.
1). You have an absorbance, and you have a straight line equation that relates absorbance to concentration. This is the line of best fit through your data.
2). Now this is the absorbance of your DILUTED solution. But what was the concentration of your ORIGINAL solution?

\[ y = 0.6717x \Rightarrow Abs = 0.6717(\text{concentration}) \]

\[ Abs = 0.432 \]

\[ 0.432 = 0.6717(\text{concentration}) \]

Concentration = 0.643M
Remember you diluted it once, so you can use the Dilution Equation

\[ M_1 V_1 = M_2 V_2 \]

*Your diluted sample was* \( 0.643M = M_1 \)

*The volume of that solution was 3mL Unknown and 7mL Water*

\[ 3mL + 7mL = 10mL = V_1 \]

*The initial volume of your Unknown was 3mL = V_2*

\[
\begin{align*}
\left( 0.643M \right) \times \left( 10mL \right) &= M_2 \left( 3mL \right) \\
\left( 6.43M \times mL \right) &= M_2 \left( 3mL \right) \\
\frac{(6.43M \times mL)}{(3mL)} &= \frac{M_2(3mL)}{(3mL)} = 2.14M = M_2
\end{align*}
\]

*The original unknown concentration was 2.14M*
**Common Errors In Calibration Plots**

- Spectrophotometer is not calibrated
- Abs readings are incorrect
- Diluted samples are prepared incorrectly or contaminated
- Inappropriate wavelength chosen for calibration graph
- The calibration line is not a "best fit" line