- One of the most common tasks in chemistry is to determine the **concentration** of a chemical in an aqueous solution.
- However, what if other components in the solution distort the analyte's signal?
- This distortion is called a matrix interference or matrix effect.

- How to overcome matrix interferences?
- Used a technique: ***standard addition***.

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Matrix Interferences

- Sometimes, response to analyte can be decreased or increased by something else in the sample.

- **Matrix** refers to everything in the sample other than analyte.

- This presents a problem when the **calibration standards** are made up in a different matrix than the samples being analyzed

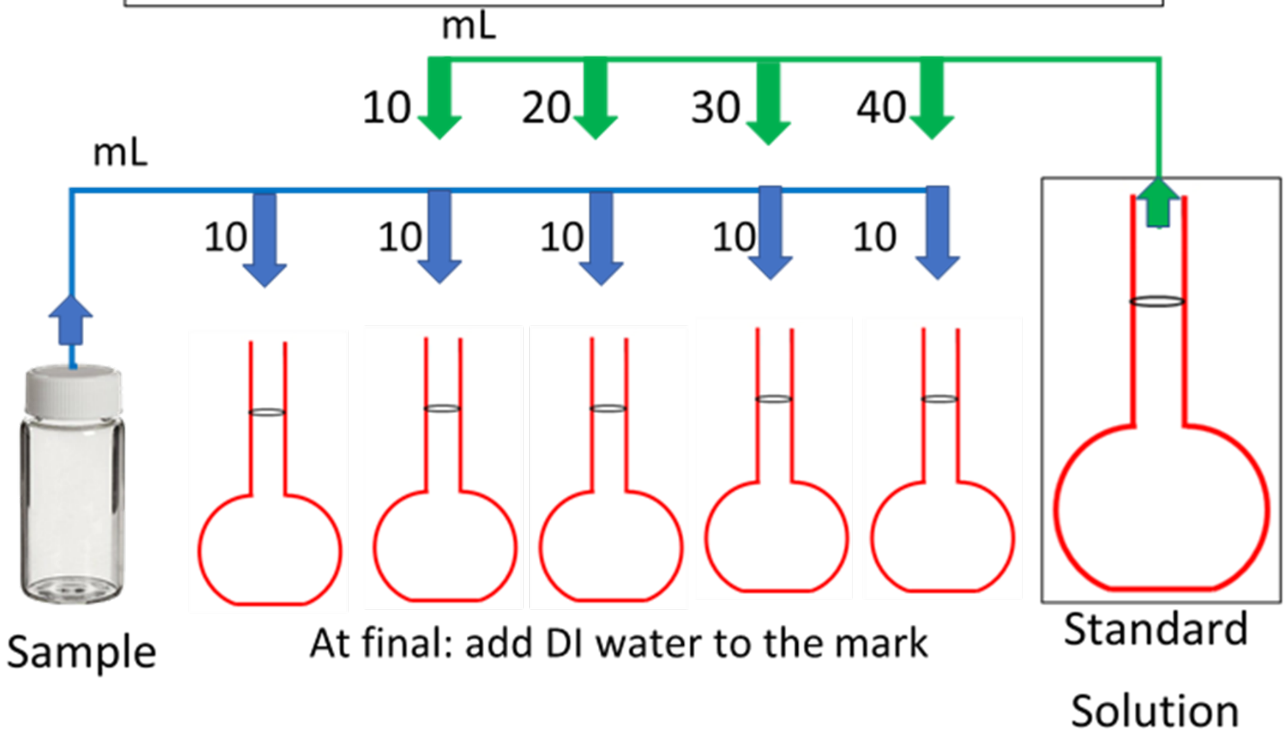
  - For example, the tap water samples vs. the calibration standards in the AAS lab

Standard Additions Calibration

- Standard additions are especially useful when matrix effects are important.

- A **standard addition** is a **known** quantity of **analyte** added to an **unknown** to increase the concentration of analyte.

Adding the standard to the sample is commonly called "*spiking* the sample."



C_x	Unknown analyte concentration
V_x	Unknown volume
C_s	Standard solution concentration
V_s	Standard solution volume
V_t	Total volume

Using an instrument:

$$S_{signal} = K \cdot C_{analyte}$$

$$C_{analyte} = C_x + C_S$$

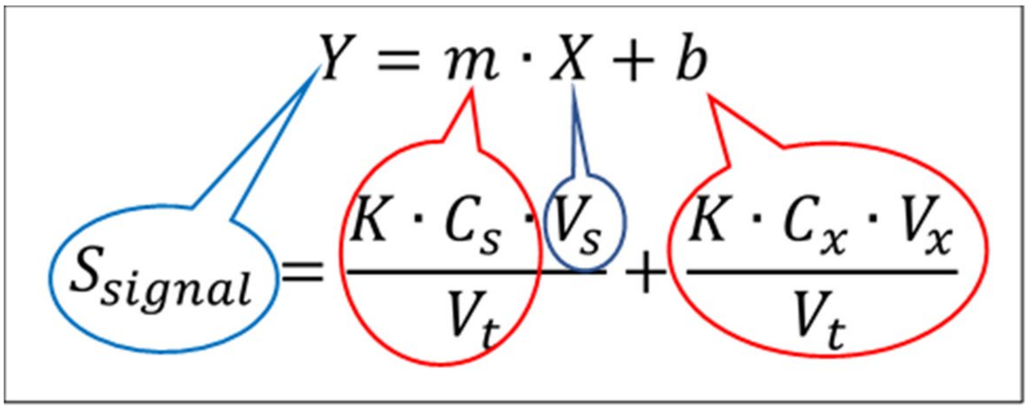
$$Molarity = C = \frac{n}{V}$$

$$C_{analyte} = \frac{n_a}{V_{total}}$$

$$n_{analyte} = C_s \cdot V_s + C_x \cdot V_x$$

$$C_{analyte} = \frac{C_s \cdot V_s + C_x \cdot V_x}{V_t}$$

$$S_{signal} = \frac{K \cdot C_s \cdot V_s}{V_t} + \frac{K \cdot C_x \cdot V_x}{V_t}$$

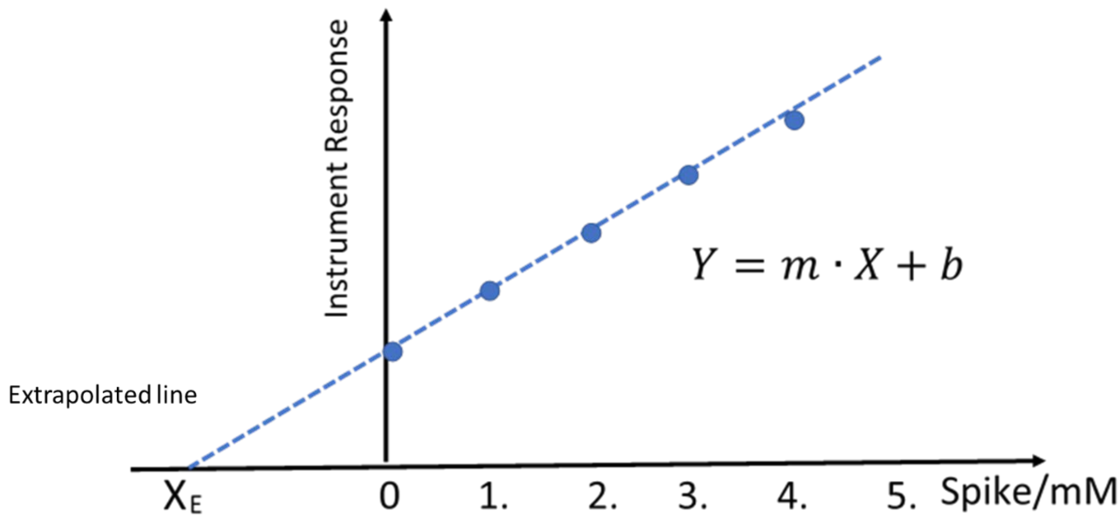


$$\frac{b}{m} = \frac{\dfrac{K \cdot C_x \cdot V_x}{V_t}}{\dfrac{K \cdot C_s}{V_t}} = \frac{C_x \cdot V_x}{C_s}$$

$$\frac{b}{m} = \frac{C_x \cdot V_x}{C_s}$$

$$C_x = \frac{b \cdot C_s}{m \cdot V_x}$$

C_x	Unknown analyte concentration
V_x	Unknown volume
C_s	Standard solution concentration



Uncertainty in the *x*-Intercept (u_x)

$$u_x = \frac{s_y}{|m|}\sqrt{\frac{1}{k} + \frac{1}{n} + \frac{(\bar{y})^2}{m^2 \sum (x_i - \bar{x})^2}}$$

m = slope
k = number of replicate measurements for unknown
n = number of data points for calibration line
$\bar{y}$ = **mean** value of measured *y* for **unknown** *x*
S_y = error of the regression