Method of Standard Addition

You can determine the concentration of an unknown concentration Cx by fluorescence using the method of standard addition. To a volumetric flask of volume Vt you add (i) a volume Vx of the unknown concentration Cx and (ii) volume Vs of a solution with a known concentration Cs.

For example:
Make five solutions by addition of Vs where Vs = nΔ n= 0 to 4; Δ = 5 mL

For each solution, the # of moles is CxVx + CsVs and volume is always Vt.

The concentration is: $$\frac{C_x V_x + C_s V_s}{V_t} = \frac{C_x V_x}{V_t} + \frac{C_s V_s}{V_t}$$

The Absorbance is: $$A = \epsilon d \left(\frac{C_x V_x}{V_t} + \frac{C_s V_s}{V_t} \right) = b + m V_s$$

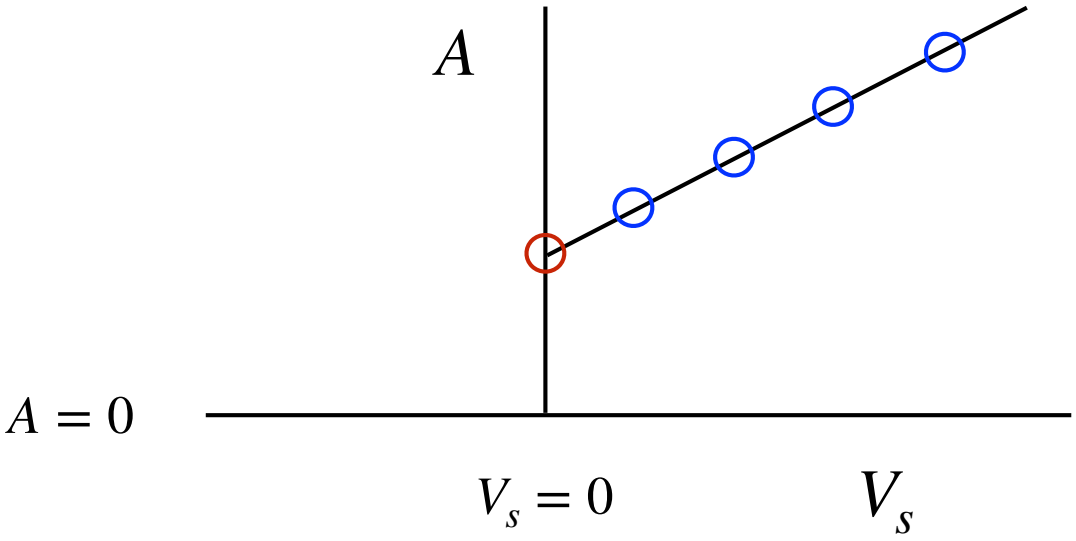
Plot Absorbance vs Vs and fit with a straight line to get m & b.

R. Corn - M3LC

Method of Standard Addition

$$A = \epsilon d\left(\frac{C_x V_x}{V_t} + \frac{C_s V_s}{V_t}\right) = b + mV_s$$

$$\frac{b}{m} = \frac{C_x V_x}{C_s} \longrightarrow \boxed{C_x = \frac{bC_s}{mVx}}$$

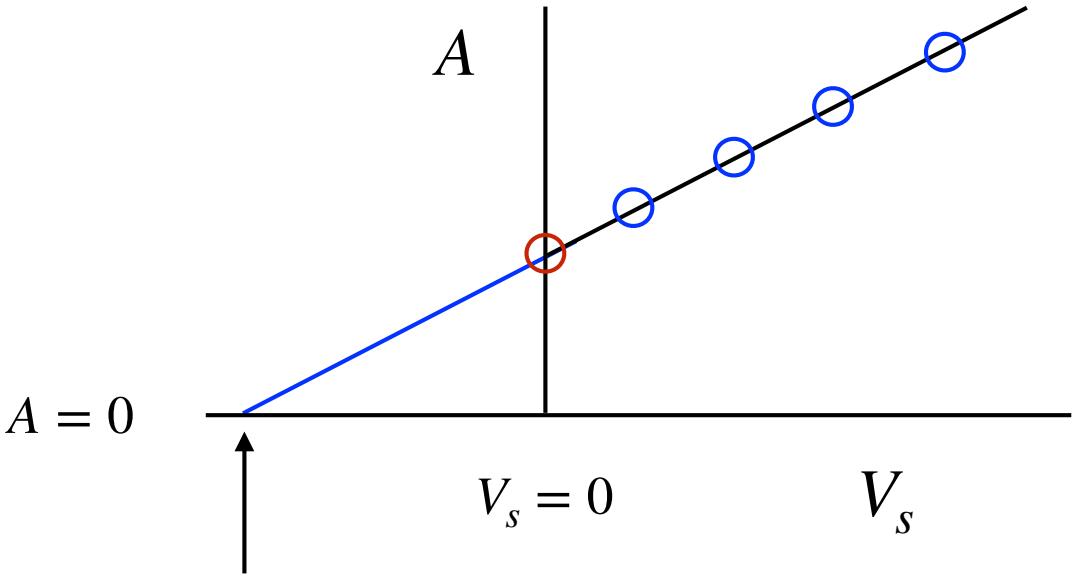


We can calculate Cx using b/m!

Method of Standard Addition

$$A = \epsilon d\left(\frac{C_x V_x}{V_t} + \frac{C_s V_s}{V_t}\right) = b + mV_s$$

$$\frac{b}{m} = \frac{C_x V_x}{C_s} \longrightarrow \boxed{C_x = \frac{bC_s}{mVx}}$$



A=0 intercept gives you b/m!

Method of Standard Addition

$$A = \epsilon d\left(\frac{C_x V_x}{V_t} + \frac{C_s V_s}{V_t}\right) = b + mV_s$$

$$\frac{b}{m} = \frac{C_x V_x}{C_s} \longrightarrow \boxed{C_x = \frac{bC_s}{mVx}}$$

Standard deviation for Cx is sc:

$$s_c = \frac{s_r}{m}\sqrt{\frac{1}{N} + \frac{(\bar{y})^2}{m^2 S_{xx}}}$$

Book has different incorrect equation. See handout & paper.

95% confidence interval: $C_x \pm t_{N-2} s_c$

Method of Standard Addition

	A	B	C	D	E	F	G	H	I	J	K	L
1	**Standard #**	**x: Added Vol. (mL)**	**y: Reading**	**xi^2**	**yi^2**	**xi*yi**		**N**	5		**Standard Conc. (ppm)**	50
2	**1**	0	14	0	196	0		**xbar**	2		**Volume Unknown (mL)**	5
3	**2**	1	25	1	625	25		**ybar**	36.6		**Total Volume (mL)**	25
4	**3**	2	37	4	1369	74		**Sxx**	10			
5	**4**	3	47	9	2209	141		**Syy**	1301.2		**-x-intercept (mL or ppm)**	1.210526316
6	**5**	4	60	16	3600	240		**Sxy**	114		**xc (volume as axis,mL) (ppm)**	12.10526316
7	**SUM**	10	183	30	7999	480					**xc (conc. as axis, ppm) (ppm)**	6.052631579
8	**(SUM xi)^2**	100						**m**	11.4			
9	**(SUM yi)^2**	33489						**b**	13.8		**Note: LINEST can calculate some of these numbers for you**	
10											Linest Output	
11								**sr**	0.73029674		m	b
12								**sm**	0.23094011		sm	sb
13								**sb**	0.56568542		r^2	sr
14								**sc**	0.07106881		F	N-2
15												
16								**t (N-2)**	3.182			
17											Linest Output	
18								**95%CI**			11.4	13.8
19								**slope (m)**	0.73495449		0.230940108	0.565685425
20								**Intercept (b)**	1.80026349		0.998770366	0.730296743
21								**x-intercept**	0.22617268		2436.75	3
22											1299.6	1.6
23												
24											**matches what we calculated!**	
25												

*Please check out our spreadsheet to help you make these calculations!**

**M3LC students: see Spreadsheets Folder on the Canvas site.*