Using LINEST for multiple regression

Application to determination of concentration of unknowns

Setting up the multiple regression for the UV-vis experiment

If we treat the LINEST as a multiple regression then we can use the data for absorbance

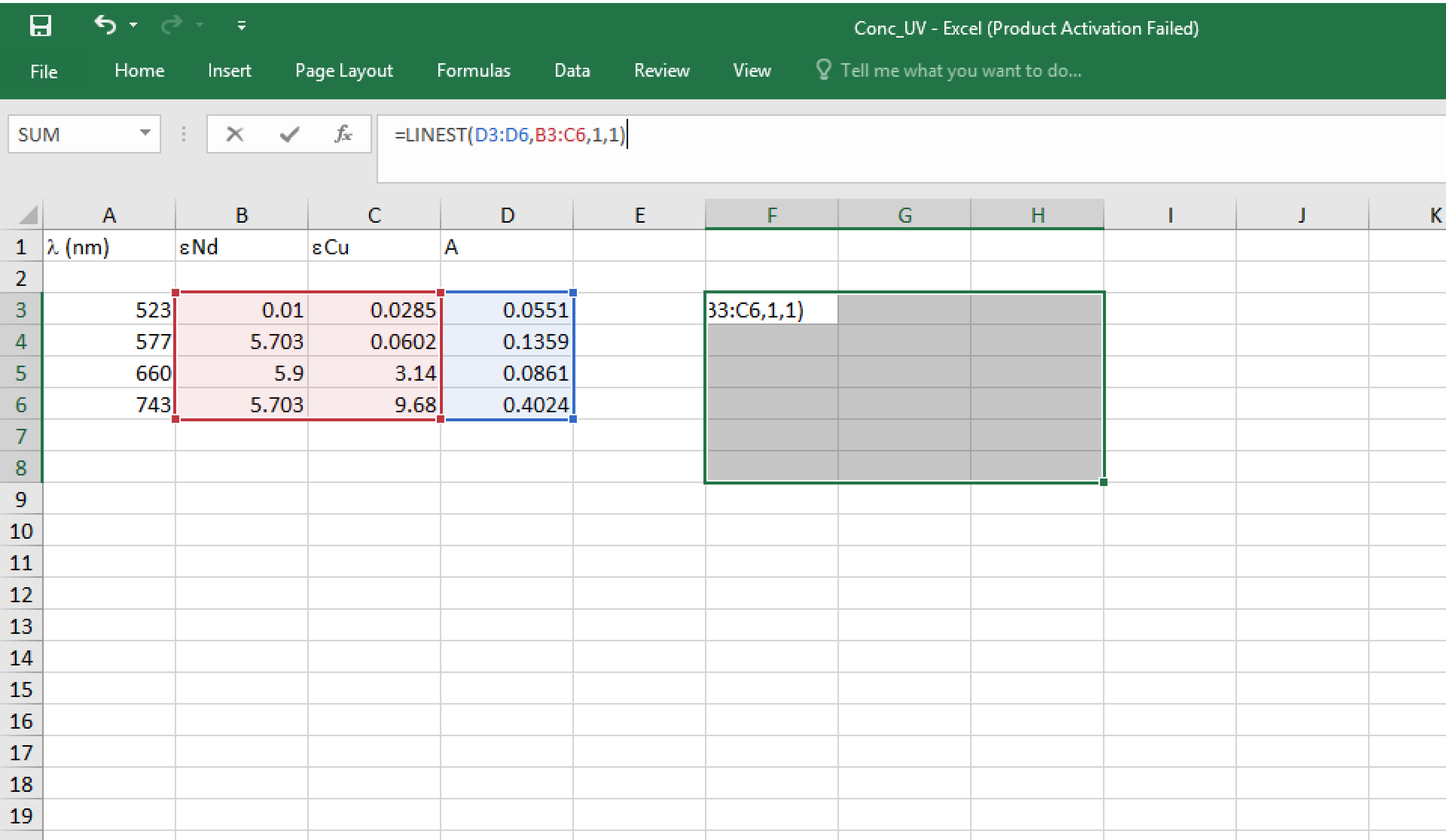
$$A = \varepsilon \ell c$$

Where $\ell = 1\ cm$ and thus we can simply write it as 1. Thus, a plot of A vs. ε should be linear with a slope equal to c, the concentration. If we have multiple concentrations then we can set up the regression as

$$\begin{matrix} \varepsilon_{11} & \varepsilon_{21} & A_1 \\ \varepsilon_{12} & \varepsilon_{22} & A_2 \\ \varepsilon_{13} & \varepsilon_{23} & A_3 \\ \varepsilon_{14} & \varepsilon_{24} & A_4 \end{matrix}$$

And the slopes of the multiple regression will be c_1 and c_2. The intercept should be zero. The standard errors can be used as the error estimate in this solution of the problem.

When defining the LINEST for this problem you need a 3 x 5 array



	A	B	C	D
1	λ (nm)	εNd	εCu	A
2				
3	523	0.01	0.0285	0.0551
4	577	5.703	0.0602	0.1359
5	660	5.9	3.14	0.0861
6	743	5.703	9.68	0.4024

Implement the LINEST using <crtl><shift><enter>

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F3 | {=LINEST(D3:D6,B3:C6,1,1)}

	A	B	C	D	E	F	G	H
1	λ (nm)	εNd	εCu	A				
2						[Cu]	[Nd]	
3	523	0.01	0.0285	0.0551		0.0312065	0.00277835	0.05713867
4	577	5.703	0.0602	0.1359		0.0155653	0.02454436	0.10867783
5	660	5.9	3.14	0.0861		0.84381957	0.10852718	#N/A
6	743	5.703	9.68	0.4024		2.7014254	1	#N/A
7						0.06363558	0.01177815	#N/A

Definitions of the solution array

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F3 | f_x | m1

	A	B	C	D	E	F	G	H
1	λ (nm)	εNd	εCu	A				
2								
3	523	0.01	0.0285	0.0551		m1	m2	b
4	577	5.703	0.0602	0.1359		se1	se2	be
5	660	5.9	3.14	0.0861		R	sey	
6	743	5.703	9.68	0.4024		F	df	
7						ss reg	ss resid	

m1 = slope of regression 1
m2 = slope of regression 2
b = intercept
Next line is standard error in each
R = coefficient of determination
sey = standard error in y
F = F statistic
df = degrees of freedom