

Sample Excel Spreadsheet for Experiment 16-077: Chemical Kinetics

The two figures found below are part of a sample Excel template for the chemical kinetics experiment. You can set up a similar spreadsheet in Excel to do the calculations and graphing required for experiment 16-077.

The volumes have been entered according to Table 1 (p. 62). You should fill in the time and temperatures from your experimental data.

To determine the concentrations for each of the reagents, use $M_1V_1=M_2V_2$. For example, in trial 1, the KI concentration is $(3.0 \text{ mL})(0.200 \text{ M}) = (10.0 \text{ mL})(x \text{ M})$. Therefore $x = 0.0600 \text{ M}$.

To use excel to determine [KI] for trial 1, you would enter: `"=B5*0.200/10"` in **cell I5** (do not include quotation marks). For $[K_2S_2O_8]$ in trial 1 you would enter: `"=E5*0.100/10"` in **cell L5**. You can use the Fill Down option (found under Edit) to fill in the concentration for all the reagents.

Figure 1: Example Excel spreadsheet template for experiment 16-077

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1			solution A		solution B					conc [S2O3-2]=		M					
2			vol. (mL)	vol. (mL)	vol. (mL)	vol. (mL)			KI	Na2S2O3	KCl	K2S2O8	(NH4)2SO4	time	rate	temp.	temp
3	Trial	vol. (mL)	vol. (mL)	vol. (mL)	vol. (mL)	vol. (mL)		Trial	conc (M)	conc (M)	conc (M)	conc (M)	conc (M)	(s)		(C)	(K)
4		KI	Na2S2O3	KCl	K2S2O8	(NH4)2SO4											
5	1	3.0	2.0	0.0		1.0	4.0	1									
6	2	3.0	2.0	0.0		1.5	3.5	2									
7	3	3.0	2.0	0.0		2.0	3.0	3									
8	4	3.0	2.0	0.0		2.5	2.5	4									
9	5	3.0	2.0	0.0		3.0	2.0	5									
10	6	1.0	2.0	2.0		3.0	2.0	6									
11	7	1.5	2.0	1.5		3.0	2.0	7									
12	8	2.0	2.0	1.0		3.0	2.0	8									
13	9	2.5	2.0	0.5		3.0	2.0	9									
14	10	3.0	2.0	0.0		3.0	2.0	10									
15	11	2.0	2.0	1.0		3.0	2.0	11									
16	12	2.0	2.0	1.0		3.0	2.0	12									
17	13	2.0	2.0	1.0		3.0	2.0	13									
18	14	2.0	2.0	1.0		3.0	2.0	14									
19																	
20	Rate Constant																
21	Mixture	k	dev	dev^2													
22	1																
23	2																
24	3																
25	4																
26	5																
27	6																
28	7																
29	8																
30	9																
31	10																
32	Mean																
33	S.D.																
34	S.D.(rel)		ppt														
35																	

To determine the rate of the reaction you can use the rate equation found on page 60.

$$\text{Rate} = d[I_2]/dt = 1/2 [S_2O_3^{2-}]/dt$$

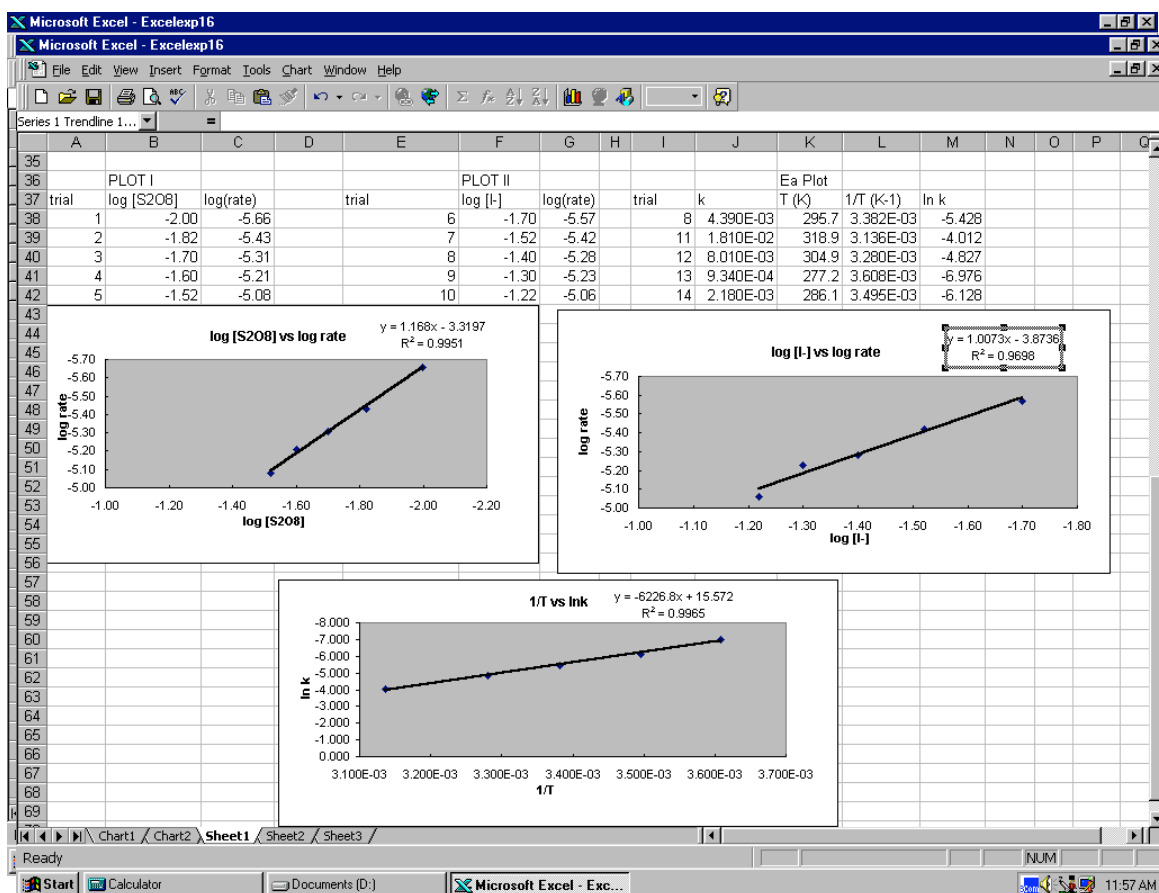
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In Excel, for trial 1, you would enter: " $=\text{(J5/2)}/\text{N5}$ " in **cell O5**. You could then use the Fill Down option (found under Edit) to calculate the rate for all of your trials.

You can use Excel to determine the log of the concentrations and the log of the rate for each of your trials (e.g. for **cell B38**, you would enter: " $=\text{log(L5)}$ " and for **cell C38**, you would enter: " $=\text{log(O5)}$ ").

To construct the appropriate plots for this experiment you can use Excel's graphing capabilities (see Graphing with Excel, p. 46). Once you have constructed the appropriate plots for experiment 16-077 and have found the best-fit line, use the slope data from your graphs to calculate k for trials 1 - 10. You can also use Excel to determine E_a for the experiment.

Figure 2: Example of Excel generated graphs for experiment 16-077



Hint : To display the axes of each of the graphs as shown above, you should click on the x-axis of each graph, then click on the "scale" tab and check the box marked "values in reverse order." You should then click on the "patterns" tab and check the box marked "high" under the heading "Tick mark labels". You should repeat this procedure for the y-axis of each graph.