Kinetic Study of the Reaction Between H_2O_2 and I^-

(typical data)

The overall stoichiometry for this reaction is

$$H_2O_2(aq) + 3I^-(aq) + 2H^+(aq) \rightarrow I_3^-(aq) + 2H_2O(l)$$

The rate of the reaction is measured by adding a very small amount of thiosulfate, $S_2O_3^{2-}$, which reacts with the I_3^-, converting it back to I^-. Once all the $S_2O_3^{2-}$ is consumed, the I_3^- that forms reacts with a starch indicator to give the solution a dark blue color. A buffer is included to maintain pH due to the consumption of H^+ in the reaction. The concentration of H^+ may affect the reaction's rate, but we will not investigate it in this experiment. The reaction's rate is

$$\text{Rate} = \frac{\Delta[S_2O_3^{2-}]}{\Delta t}$$

We might reasonably expect that the rate law has the form

$$\text{Rate} = k[I^-]^{\alpha}[H_2O_2]^{\beta}[S_2O_3^{2-}]^{\gamma}$$

where α, β, and γ are the reaction orders.

Run	$[I^-]$ (M)	$[H_2O_2]$ (M)	$[S_2O_3^{2-}]$ (M)	Time (s)	Rate (M/s)	Rate Constant
1	0.020	0.020	5.0×10^{-4}	75	6.76×10^{-6}	0.0167
2	0.020	0.040	5.0×10^{-4}	37.25	1.34×10^{-5}	0.0168
3	0.020	0.020	1.0×10^{-3}	149.75	6.68×10^{-6}	0.0171
4	0.040	0.020	5.0×10^{-4}	36.5	1.37×10^{-5}	0.0171
5	0.040	0.040	1.0×10^{-3}	37.2	2.69×10^{-5}	0.0168