

5. The following equation represents the decomposition of N_2O_5 , for which the rate law is $\text{rate} = k[\text{N}_2\text{O}_5]$.

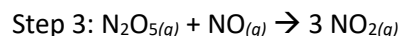
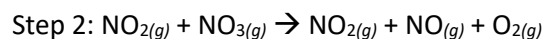
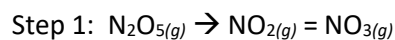


A sample of pure $\text{N}_2\text{O}_{5(g)}$ is placed in an evacuated container and allowed to decompose at a constant temperature of 300 K. The concentration of $\text{N}_2\text{O}_{5(g)}$ in the container is measured over a period of time and the measurements are recorded in the following table.

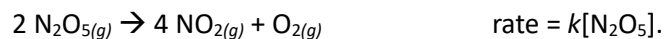
Time (hr)	$[\text{N}_2\text{O}_5] (M)$
0	0.160
1.67	0.0800
3.33	0.0400
5.00	0.0200

a) Determine the value of the rate constant, k , for the reaction. Include units in your answer.

b) The following mechanism is proposed for the decomposition of $\text{N}_2\text{O}_{5(g)}$.



Identify which step is the proposed mechanism (1, 2, or 3) is the rate-determining step. Justify your answer in terms of the rate law given.



c) If this experiment was repeated at the same temperature but with twice the initial concentration of N_2O_5 , would the value of k increase, decrease, or remain the same? Explain your reasoning.