

Conference #3 – Chem 102

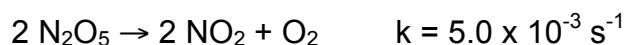
Name _____

$$\ln[A]_t = \ln[A]_o - akt$$

$$1/[A]_t = 1/[A]_o + akt$$

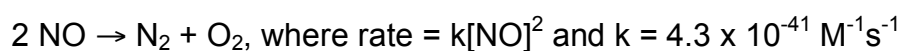
$$\tau = [A]/\text{rate of removal of A}$$

1. N_2O_5 decays in a first order process as follows:



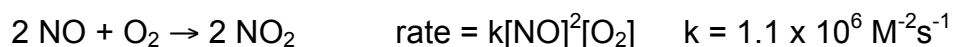
How long will it take for the concentration of N_2O_5 to drop from 0.050 M to 0.010 M?

2. NO reacts by itself in a second order process:



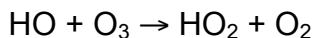
- a. What would be the half-life of NO given an initial concentration of $4.1 \times 10^{-9} \text{ M}$?

- b. NO reacts more rapidly with O_2 as follows:



Given $[\text{O}_2]$ at sea level is 0.0086 M, what is the lifetime of NO in the atmosphere?

4. Consider the following reaction mechanism



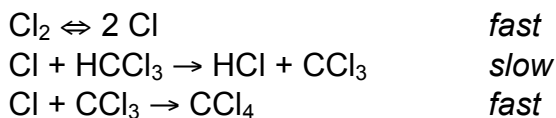
a. Write the balanced reaction for this process, identifying reactants, products, intermediates and catalysts.

b. What are the rate laws for each of these two elementary steps?

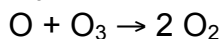
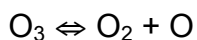
4. For the reaction: $\text{Cl}_2 + \text{HCCl}_3 \rightarrow \text{HCl} + \text{CCl}_4$

we get the unusual experimental result: $\text{rate} = k[\text{HCCl}_3][\text{Cl}_2]^{1/2}$

Show that this mechanism is consistent with the exp. rate law:



5. Use the steady state assumption to derive a rate law for the following mechanism:



a. Assume that $k_2 \gg k_{-1}$, what is the rate law if the first step is rate-determining?

b. Assume that $k_{-1} \gg k_2$, what is the rate law if the 2nd step is rate determining?