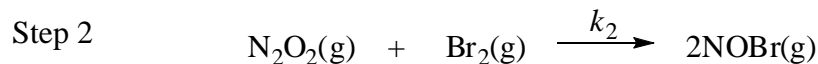
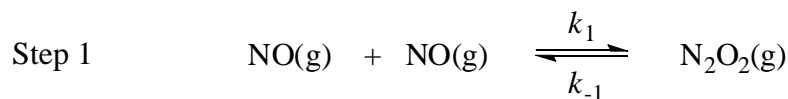


- A proposed kinetic model for the reaction of NO(g) with Br<sub>2</sub>(g) to form NOBr(g) is as follows.



If Step 2 is assumed to be very slow compared to the equilibrium of Step 1, derive the overall rate equation you would expect to see for this mechanism.

**If step 1 is at equilibrium, with equilibrium constant,  $K$ :**

$$K = [\text{N}_2\text{O}_2\text{(g)}]/[\text{NO(g)}]^2$$

$$[\text{N}_2\text{O}_2\text{(g)}] = K [\text{NO(g)}]^2$$

**Step 2 involves the bimolecular reaction of a N<sub>2</sub>O<sub>2</sub> molecule with a Br<sub>2</sub> molecule. The rate of this step is therefore:**

$$\text{rate} = k_2[\text{N}_2\text{O}_2\text{(g)}][\text{Br}_2\text{(g)}]$$

**Using the expression for [N<sub>2</sub>O<sub>2</sub>(g)] from the equilibrium step gives:**

$$\text{rate} = k_2K[\text{NO(g)}]^2[\text{Br}_2\text{(g)}] = k[\text{NO(g)}]^2[\text{Br}_2\text{(g)}] \text{ where } k = k_2K$$