Chemistry 2710 Spring 2006 Problem Set 1

1. At a particular point in time, the rate of consumption of ClO in the gas phase reaction

$$2\mathrm{ClO}_{(g)} \rightarrow \mathrm{Cl}_{2(g)} + \mathrm{O}_{2(g)}$$

is $-1.65\,\mu\mathrm{mol\,L^{-1}s^{-1}}$. What is the rate of production of Cl_2?

2. Do you think that the reaction $2\mathrm{ClO}_{(g)} \rightarrow \mathrm{Cl}_{2(g)} + \mathrm{O}_{2(g)}$ is likely to be elementary? Why or why not?

3. For the elementary reaction

$$\mathrm{H}_{(g)} + \mathrm{Br}_{2(g)} \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} \mathrm{HBr}_{(g)} + \mathrm{Br}_{(g)},$$

$k_1 = 2.09 \times 10^8\,\mathrm{L\,mol^{-1}s^{-1}}$ and the equilibrium constant is 1.5×10^{28}. What is k_{-1}?

4. Write down rate equations for $a = [\mathrm{A}]$ and $b = [\mathrm{B}]$ assuming that

$$2\mathrm{A} \underset{k_-}{\overset{k_+}{\rightleftharpoons}} 3\mathrm{B}$$

is an elementary reaction.