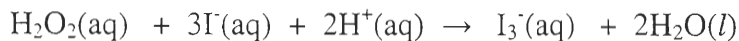


1. a. (2 Pts) Write a general rate law for reaction:



$$\text{rate} = k [\text{H}_2\text{O}_2]^x [\text{I}^-]^y [\text{H}^+]^z$$

b. (9 Pts) Use the initial rate data below to determine the order of the reaction with respect to each reactant.

	$[\text{H}_2\text{O}_2]_0$	$[\text{I}^-]_0$	$[\text{H}^+]_0$	initial rate (M/s)
Exp. 1	0.010	0.010	0.00050	1.15×10^{-6}
Exp. 2	0.020	0.010	0.00050	2.30×10^{-6}
Exp. 3	0.010	0.020	0.00050	2.30×10^{-6}
Exp. 4	0.010	0.010	0.00100	1.15×10^{-6}

② for $[\text{I}^-]$ use Exp. 3 & 1

$$\frac{2.30 \times 10^{-6}}{1.15 \times 10^{-6}} = \left[\frac{0.020}{0.010} \right]^y$$

$$2 = (2)^y \quad y = 1$$

① for $[\text{H}_2\text{O}_2]$ use Exp. 1 & 2

$$\frac{\text{rate}_2}{\text{rate}_1} = \frac{k [\text{H}_2\text{O}_2]_2^x [\text{I}^-]_2^y [\text{H}^+]_2^z}{k [\text{H}_2\text{O}_2]_1^x [\text{I}^-]_1^y [\text{H}^+]_1^z}$$

$$\frac{2.30 \times 10^{-6}}{1.15 \times 10^{-6}} = \left[\frac{0.020}{0.010} \right]^x$$

$$2 = (2)^x \quad x = 1$$

③ for $[\text{H}^+]$ use Exp. 4 & 1

$$\frac{1.15 \times 10^{-6}}{1.15 \times 10^{-6}} = \left[\frac{0.00100}{0.00050} \right]^z$$

$$1 = (2)^z \quad z = 0$$

c. (3 Pts) Determine the value of the rate constant and its units.

$$\text{rate} = k [\text{H}_2\text{O}_2]^1 [\text{I}^-]^1 [\text{H}^+]^0$$

Using Exp 1 (or any other): $k = \frac{\text{rate}}{[\text{H}_2\text{O}_2][\text{I}^-]} = \frac{1.15 \times 10^{-6}}{[0.010][0.010]} = \underline{\underline{0.0115 \text{ M}^{-1} \text{ s}^{-1}}}$

2. (4 Pts) Determine the units for each of the following rate laws:

a. $\text{rate} = k[\text{A}]^2[\text{B}]$ $\frac{\text{M}}{\text{t}} = \frac{\text{M}^2 \text{M}}{\text{M}^2 \text{t}}$ or $\frac{1}{\text{M}^2 \text{t}}$

b. $\text{rate} = k[\text{A}][\text{B}]$ $\frac{\text{M}}{\text{t}} = \frac{\text{M} \text{M}}{\text{M} \text{t}}$ or $\frac{1}{\text{M} \text{t}}$

3. (3 Pts) Why and how does the rate of a reaction at constant temperature change as time proceeds?

The reaction slows down as the reactants are consumed and there are less collisions.

4. (4 Pts) Write a balanced equation for the following expression:

$$\text{rate} = \frac{-\Delta[\text{N}_2\text{O}_5]}{2\Delta t} = \frac{\Delta[\text{NO}_2]}{4\Delta t} = \frac{\Delta[\text{O}_2]}{\Delta t}$$

