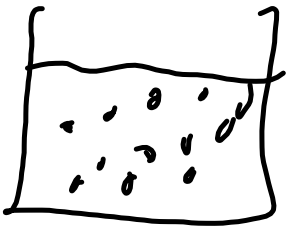
$$2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$$



$H_2O_2(aq)$

$$R = -\frac{\Delta[H_2O_2]}{2\Delta t}$$

$$H_2O_2(aq) \longrightarrow H_2O(l) + \frac{1}{2}O_2(g)$$

$$R = -\frac{\Delta[H_2O_2]}{\Delta t}$$

$$H_2O_2(aq) \rightarrow H_2O(l) + \frac{1}{2} O_2(g)$$

$$R = -\frac{\Delta[H_2O_2]}{\Delta t}$$

0 – 60 s

$$\Delta[H_2O_2] = [H_2O_2]_f - [H_2O_2]_i$$

$$= 0.697\ M - 0.882\ M$$

$$= -0.185\ M$$

$$\Delta t = t_f - t_i$$

$$= 60\ s - 0\ s = 60\ s$$

$$R = -\frac{\Delta[H_2O_2]}{\Delta t} = -\frac{-0.185\ M}{60\ s}$$

$$= +3.08 \times 10^{-3} \frac{M}{s}$$

$$H_2O_2(aq) \rightarrow H_2O(l) + \frac{1}{2}O_2(g)$$

$$R = -\frac{\Delta[H_2O_2]}{\Delta t}$$

$$\Delta t = t_f - t_i$$

$$= 600\,s - 540\,s = 60\,s$$

$$\Delta[H_2O_2] = [H_2O_2]_f - [H_2O_2]_i$$

$$= 0.094\,M - 0.120\,M$$

$$= -0.026\,M$$

$$R = -\frac{\Delta[H_2O_2]}{\Delta t} = -\frac{-0.026\,M}{60\,s}$$

$$= +4.33 \times 10^{-4}\,\frac{M}{s}$$

0 - 60 s $3.08 \times 10^{-3} \frac{m}{s}$

$(0.00308 \frac{m}{s})$

540 - 600 s $4.33 \times 10^{-4} \frac{m}{s}$

$(0.000433 \frac{m}{s})$

THE RATE LAW

$2A + B \rightarrow 2C$

$R = k[A]^{x}[B]^{y}$

$R \overset{?}{=} k[A]^{2}[B]$ This is guaranteed to be true ONLY if the reaction is elementary

$$2A + B \rightarrow 2C$$

$$R = k[A]^x[B]^y$$

$$5.7 \times 10^{-5}\ mol\,L^{-1}\,s^{-1} = k(0.0039\ mol\,L^{-1})^x(0.0045\ mol\,L^{-1})^y$$

$$1.9 \times 10^{-5}\ mol\,L^{-1}\,s^{-1} = k(0.0013\ mol\,L^{-1})^x(0.0045\ mol\,L^{-1})^y$$

$$\frac{5.7}{1.9} = \frac{(0.0039\ mol\,L^{-1})^x}{(0.0013\ mol\,L^{-1})^x} = \left(\frac{0.0039\ mol\,L^{-1}}{0.0013\ mol\,L^{-1}}\right)^x$$

$$3 = (3)^x \longrightarrow x = 1$$

$$\frac{a^x}{b^x} = \left(\frac{a}{b}\right)^x$$

$$2A + B \rightarrow 2C$$

$$R = k[A]^1[B]^y$$

$$\frac{3.8 \times 10^{-5}\ mol\,L^{-1}\,s^{-1} = k(0.0013\ mol\,L^{-1})^1(0.0090\ mol\,L^{-1})^y}{1.9 \times 10^{-5}\ mol\,L^{-1}\,s^{-1} = k(0.0013\ mol\,L^{-1})^1(0.0045\ mol\,L^{-1})^y}$$

$$\frac{3.8}{1.9} = \left(\frac{0.0090\ mol\,L^{-1}}{0.0045\ mol\,L^{-1}}\right)^y$$

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

$$R = k[A]^1[B]^1 = k[A][B]$$

$$R = k[A][B]$$

↓ solve for k

$$k = \frac{R}{[A][B]} =$$

$$= \frac{1.9 \times 10^{-5}\ mol\,L^{-1}\,s^{-1}}{(0.0013\ mol\,L^{-1})(0.0045\ mol\,L^{-1})} = 3.2\ mol^{-1}\,L\,s^{-1}$$

$$\frac{mol\,L^{-1}\,s^{-1}}{mol^2\,L^{-2}} = mol^{-1}\,L\,s^{-1}$$

$$R = 3.2\ mol^{-1}\,L\,s^{-1}[A][B]$$

$$2A + B \rightarrow 2C$$

$$R = 3.2\ mol^{-1}\ L\ s^{-1}[A][B]$$

$$= 3.2\ mol^{-1}\ L\ s^{-1}(0.0025\ mol\ L^{-1})(0.0075\ mol\ L^{-1})$$

$$= 6.0 \times 10^{-5}\ mol\ L^{-1}\ s^{-1}$$

units of k:

$$mol^{1-\text{overall order}} \cdot L^{\text{overall order}-1} \cdot time^{-1}$$