

$$1) \quad [A] \quad \frac{0.3}{0.1} = 3 \quad \text{Rate} \quad \frac{15 \times 10^{-3}}{5.0 \times 10^{-3}} = 3$$

First order in  
[A]

$$[A] \quad \frac{0.2}{0.1} = 2 \quad [B] \quad \frac{2.0 \times 10^{-2}}{1.0 \times 10^{-2}} = 2 \quad \text{Rate} \quad \frac{10 \times 10^{-3}}{5 \times 10^{-3}} = 2$$

zero order in  
[B]

$$\text{Rate} = k[A]$$

2)  $[\text{CH}_3\text{CHO}]$

Rate

a.  $\frac{0.02}{0.01} = 2$

$$\frac{3.6 \times 10^{-6}}{9.0 \times 10^{-7}} = 4$$

second order in  $[\text{CH}_3\text{CHO}]$

$$\text{Rate} = k [\text{CH}_3\text{CHO}]^2$$

b.  $k = \frac{\text{Rate}}{[\text{CH}_3\text{CHO}]^2} = \frac{9.0 \times 10^{-7} \frac{\text{mol}}{\text{L s}}}{\left(0.010 \frac{\text{mol}}{\text{L}}\right)^2}$

$$= 9.0 \times 10^{-3} \frac{\text{L}}{\text{mol s}}$$

c.  $\text{Rate} = \left(9.0 \times 10^{-3} \frac{\text{L}}{\text{mol s}}\right) \left(0.03 \frac{\text{mol}}{\text{L}}\right)^2$

$$= 8.1 \times 10^{-6} \frac{\text{mol}}{\text{L s}}$$



3) [A]                      Rate

$$\frac{0.200}{0.100} = 2 \qquad \frac{2.2 \times 10^{-5}}{5.5 \times 10^{-6}} = 4 \qquad [A]^2$$

[B]                      Rate

$$\frac{0.300}{0.100} = 3 \qquad \frac{1.65 \times 10^{-5}}{5.5 \times 10^{-6}} = 3 \qquad [B]$$

$$\text{Rate} = k [A]^2 [B]$$

$$k = \frac{\text{Rate}}{[A]^2 [B]}$$

$$= \frac{5.50 \times 10^{-6} \frac{\text{mol}}{\text{L s}}}{\left(0.100 \frac{\text{mol}}{\text{L}}\right)^2 \left(0.100 \frac{\text{mol}}{\text{L}}\right)}$$

$$= 5.5 \times 10^{-3} \frac{\text{L}^2}{\text{mol}^2 \text{ s}}$$

$$4) \text{ Rate} = k [I]^2$$

$$\frac{1}{[A]} = \frac{1}{[A]_0} + kt$$

$$2.0 \text{ min} \times \frac{60 \text{ sec}}{1 \text{ min}} = 120 \text{ sec}$$

$$\frac{1}{[A]} = \frac{1}{0.086 \frac{\text{mol}}{\text{L}}} + \left(7.0 \times 10^9 \frac{1}{\text{s}}\right) (120 \text{ s})$$

$$\frac{1}{[A]} = 8.4 \times 10^{11}$$

$$[A] = 1.2 \times 10^{-12} \text{ M}$$



$$5) \quad \text{Rate} = k[A]$$

$$k = \frac{\text{Rate}}{[A]} = \frac{1.6 \times 10^{-2} \text{ mol/Ls}}{0.35 \text{ mol/L}}$$

$$= 4.57 \times 10^{-2} \text{ 1/s}$$

$$\text{Rate} = k[A]^2$$

$$k = \frac{\text{Rate}}{[A]^2} = \frac{1.6 \times 10^{-2} \text{ mol/Ls}}{(0.35 \text{ mol/L})^2}$$

$$= 1.31 \times 10^{-1} \text{ L/mol s}$$