$$y = mx + b$$

1° ← → 2°

1°

$$\ln A_t = -kt + \ln A_0$$
($y = mx + b$)

$m = \frac{\Delta y}{\Delta x}$ $\quad \frac{\Delta[\,]}{\Delta t}$

$\ln 100 = 4.65$

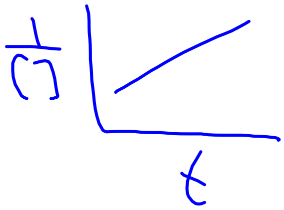
$\ln 1 = \varnothing$

$$t_{1/2} = \frac{0.693}{k}$$

2°

$$y = m x + b$$

$$\frac{1}{[A_t]} = kt + \frac{1}{[A_0]}$$



$$t_{1/2} = \frac{1}{k[A_0]}$$

Feb 3-7:39 AM

(14.40) $2N_2O_{5(g)} \rightarrow 4NO_{2(g)} + O_{2(g)}$ (70°)

1°

$k = 6.82 \times 10^{-3} \frac{1}{M^0\ \text{sec}}$

$\frac{0.025\ \text{moles}}{2\ \text{L}}$ ← # moles after 5 min (t)

A^0 $\quad A_t$

$$\ln A_t = -kt + \ln A_0$$

$$\ln A_t = (-6.82 \times 10^{-3})(300) + \ln(0.0125)$$

$$\ln A_t = -6.43$$

$$A_t = 1.6 \times 10^{-3}\ M \times 2\ \text{L}$$

$$= 3.2 \times 10^{-3}\ \text{moles}$$

$M = \frac{\text{moles}}{\text{L}}$

Feb 3-8:10 AM

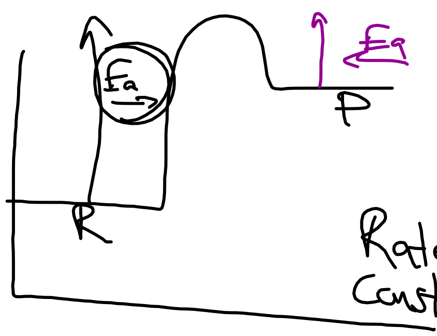
(14.40 b) 0.025 mole → (time?) 0.01 mole

$$\ln A_t = -kt + \ln A_0$$

$$\ln\left(\frac{0.01}{2}\right) = (-6.82\times10^{-3})\,t + \ln\left(\frac{0.025}{2}\right)$$

Feb 3-8:20 AM

Activation Energy



(E_a)

collisions (effective)

$$k = A e^{-\frac{E_a}{RT}}$$

Rate Constant

8.314 J

8.314×10^{-3} kJ

Temp Kelvin

Feb 3-8:35 AM

$$K = A e^{\left(-\frac{E_a}{RT}\right)}$$

$$\ln K = \ln\left(A e^{-\frac{E_a}{RT}}\right)$$

RULE: $\ln AB = \ln A + \ln B$

$$\ln K = \ln A + \ln e^{-\frac{E_a}{RT}}$$

$$\ln K = \ln A + \frac{-E_a}{RT}$$

$$\ln K = \frac{-E_a}{RT} + \ln A$$

$$y = mx + b$$

Feb 3-8:42 AM

2 different Temps ⇒ 2 diff "K" (rate constants)

$$\left[\ln K_1 = \frac{-E_a}{RT_1} + \ln A\right] - \left[\ln K_2 = \frac{-E_a}{RT_2} + \ln A\right]$$

$$\ln K_1 - \ln K_2 = \left(\frac{-E_a}{RT_1} + \ln A\right) - \left(\frac{-E_a}{RT_2} + \ln A\right)$$

$$\ln \frac{K_1}{K_2} = \left(-\frac{E_a}{RT_1} - -\frac{E_a}{RT_2}\right)$$

$$\ln \frac{K_1}{K_2} = \frac{-E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

$$* \quad \ln \frac{K_1}{K_2} = \frac{E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right) \quad *$$

Units. J or kJ

Feb 3-8:48 AM

Given $K_1 = 2.52 \times 10^{-5}$ at T_1 189.7 °C

Find K_2 at T_2 430 K

$E_a = \frac{160\ kJ}{mol}$

$$\ln \frac{K_1}{K_2} = \frac{E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

$$\ln \frac{2.5 \times 10^{-5}}{K_2} = \frac{160}{8.314 \times 10^{-3}}\left(\frac{1}{430} - \frac{1}{462.7}\right)$$

(1.64×10^{-4})

$$\ln \frac{2.5 \times 10^{-5}}{K_2} = 3.163$$

$\ln 2.5 \times 10^{-5} - \ln K_2 = 3.163$

-10.5967

$-\ln K_2 = 13.7597$

$\ln K_2 = -13.7597$

$K_2 = 1.05 \times 10^{-6}$

$e^{\ln \frac{2.5 \times 10^{-5}}{K_2}} = e^{3.163}$

$\frac{2.5 \times 10^{-5}}{K_2} = \frac{23.64}{1}$

$K_2 = \frac{2.5 \times 10^{-5}}{23.64}$

$K = 1.05 \times 10^{-6}$

Feb 3-8:55 AM

Expt	[ ]	Rate
(1)	2	1
(2)	4	8

$2^{3} = 8$

Feb 3-9:11 AM

Expt	[ ]	Rate
(1)	2	3
(2)	4	9

$$2^{x} = 3$$

$$\ln 2^{x} = \ln 3$$

$$\frac{x \ln 2}{\ln 2} = \frac{\ln 3}{\ln 2}$$

$$x = 1.58$$

Feb 3-9:12 AM

PS 14-1

#1-7, 10-20

OR

1-20 SK, p #8 + 9

Feb 3-9:16 AM