2nd order

$\frac{\Delta[\ ]}{\Delta t}$ Slope = +K

$y = mx + b$

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

At half life
$[A_{t_{1/2}}] = \frac{1}{2}[A_0]$

$$\frac{1}{\frac{1}{2}A_0} = Kt_{1/2} + \frac{1}{A_0}$$

$$\frac{2}{A_0} - \frac{1}{A_0} = Kt_{1/2}$$

$$\frac{1}{A_0} = Kt_{1/2}$$

$$\frac{1}{[A_0]K} = t_{1/2}$$ 2°

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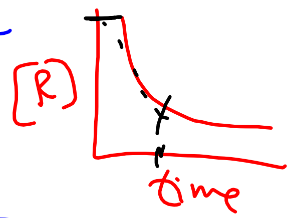
① $\frac{-\Delta[\text{React}]}{\Delta t} = \frac{+\Delta[\text{Products}]}{\Delta t}$

disapp = App.



② $\text{Rate} = K[R_1]^m[R_2]^n$ ← DATA TABLE

Rate Law

③ 1° $y = mx + b$

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

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

conc

$t_{1/2}$

2° $y = mx + b$

$\frac{1}{A_t} = Kt + \frac{1}{A_0}$

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

Feb 2-10:53 AM

(4) Rate changes with Temperature

∴ Temp affects constants!

$K_1 \rightarrow T_1$ New $\Rightarrow$ $K_2 = T_2$

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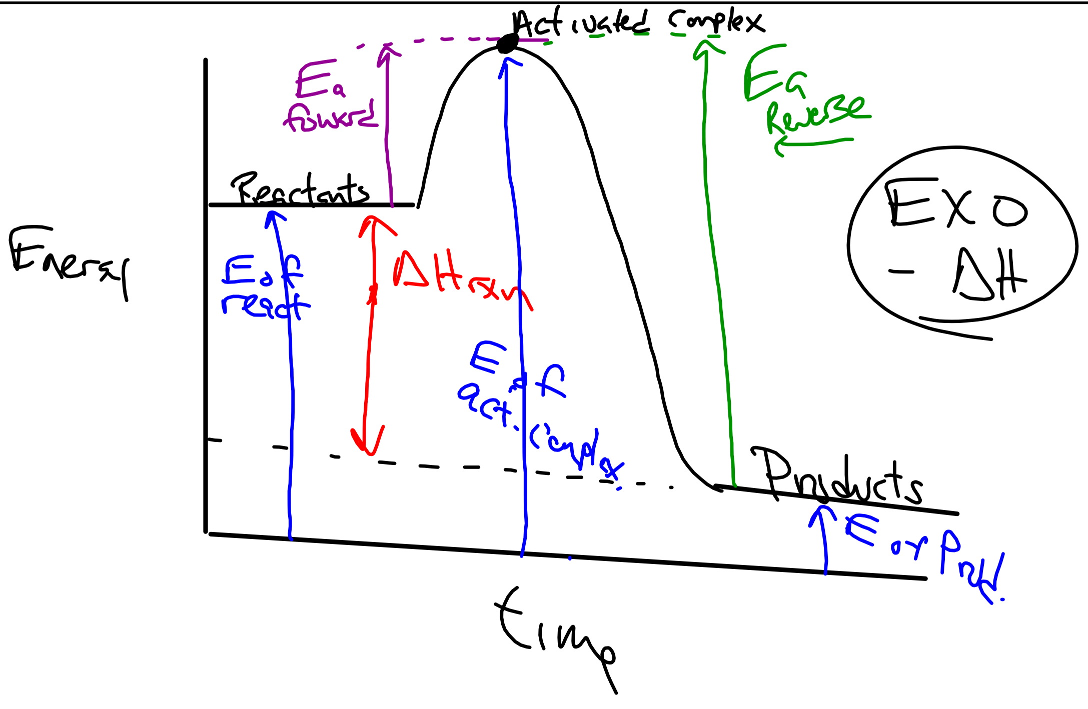

Feb 2-10:59 AM

Arrhenius Eqn

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

- E_a ← Act. energy
- T ← Temp in KELVIN
- R ← universal gas constant. 8.314 J/Mole.K.
- K ← Rate Constant

Units E_a and R

Feb 2-11:04 AM

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

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

$\ln x = e^x$

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

$$y = mx + b$$

$$\ln K_1 = \frac{-E_a(1)}{RT_1} + \ln A$$

$m = \frac{-E_a}{R}$

$y = \ln K$

$x = \frac{1}{T}$

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$$\ln K_1 = \frac{-E_a}{RT_1} + \ln A \quad \Big\} \quad \ln K_2 = \frac{-E_a}{RT_2} + \ln A$$

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

$$\ln \frac{K_1}{K_2} = \frac{-E_a}{RT_1} - \frac{-E_a}{RT_2}$$

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

$$\boxed{\ln \frac{K_1}{K_2} = \frac{E_a}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)} \longleftarrow \text{Change in Temp}$$

Feb 2-11:10 AM

Ex) $E_a = 160\ KJ$ $T_1\ 430K$, $K_1 = ?$

$R = 8.314\ J/mol\,K$ $T_2\ 462.9K$, $K_2 = 2.52\times10^{-5}$

$8.314\times10^{-3}\ KJ/mol\,K$

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

$$\ln \frac{K_1}{2.52\times10^{-5}} = \frac{160}{8.314\times10^{-3}}\left(\frac{1}{462.9} - \frac{1}{430}\right)$$

$$e^{\ln \frac{K_1}{2.52\times10^{-5}}} = e^{-3.18}$$

$$\frac{K_1}{2.52\times10^{-5}} = \frac{0.0415}{1}$$

$K_1 = 1.05\times10^{-6}$

Feb 2-11:16 AM

2°

$$\frac{1}{M \cdot sec} = \frac{1}{\frac{mole}{l} \cdot sec} = \frac{l}{mole \cdot sec}$$

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PS 14-1

1-7, 11-18

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