(14.38) 1° $k = 0.271 \frac{1}{M^{\circ} \cdot sec} = \frac{1}{sec}$

(a) $t_{1/2} = \frac{0.693}{k} = \frac{0.693}{0.271} = 2.56 sec.$

(b) $[A_0] = 0.05M$, $t = 5.12 sec$, $k = 0.271$ sec^{-1} (same units)

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

$\ln A_t = (-0.271)(5.12) + \ln(0.05)$

$\ln A_t = -4.38$

$A_t = 0.0125\ M$

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

Half life: $\frac{1}{2}[A_0] = A_{1/2}$

$\ln A_{t_{1/2}} = -k t_{1/2} + \ln A_0$

$\ln A_{t_{1/2}} - \ln A_0 = -k t_{1/2}$

$\ln \frac{A_{t_{1/2}}}{A_0} = -k t_{1/2}$

$\ln \frac{\frac{1}{2} A_0}{A_0} = -k t_{1/2}$

$\ln \frac{1}{2} = -k t_{1/2}$

$-0.693 = -k t_{1/2}$

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

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LOG RULE ln + log

$\ln A - \ln B = \ln \frac{A}{B}$

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

$\ln A^B = B \ln A$

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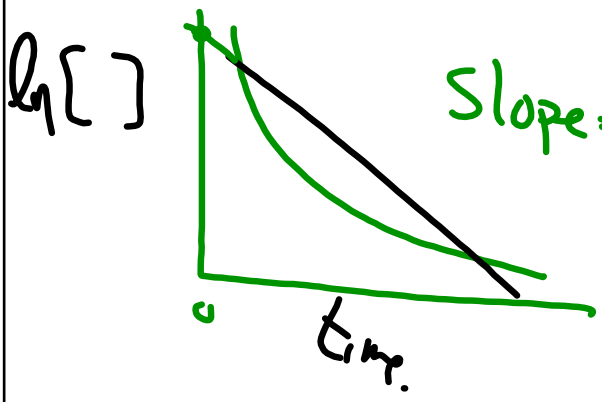
$\ln A_t = -kt + \ln A_0$

$y = mx + b$



A_0 = original

A_t = [ ] after a period of time

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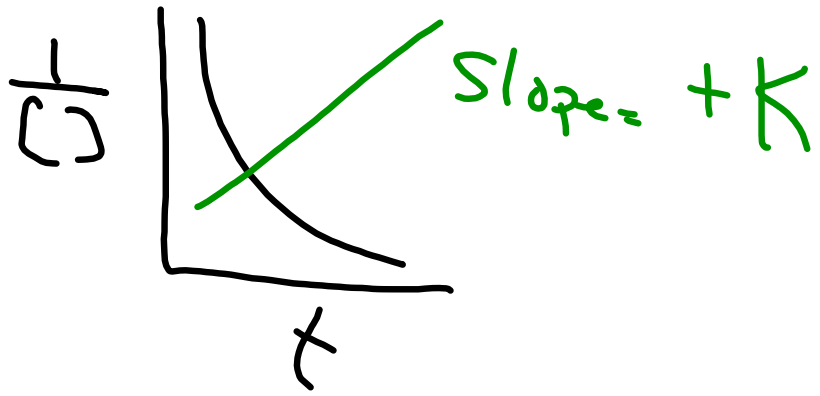
$$\frac{1}{A_t} = kt + \frac{1}{A_0}$$



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1° + 2°

how M changes over time.

$[A_0]$ → $[A_t]$

$t_{ime} = 0$ $t_{ime} = t$

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Arrhenius Eqn

Compare the rate constants at 2 different Temperatures.

* The only thing that can change a constant is TEMPERATURE *

Feb 22-8:06 AM

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

J or KJ → Kelvin!

K_1 = rate constant 1 — Temp 1

K_2 = rate constant 2 — Temp 2

$R = 0.08206 \frac{L \cdot atm}{mole \cdot K}$

E_a = Activation energy (J) 8.31 J/mole·K

Feb 22-8:08 AM

Ea and R

→ SAME UNITS

either J OR KJ

$\frac{8.314\ J}{mol \cdot K}$ $\frac{8.314 \times 10^{-3}\ J}{mol \cdot K}$

Feb 22-8:11 AM

HW

14/55

Feb 22-8:13 AM