Arrhenius Equation

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

$$R = 8{,}314 \frac{J}{K\,mol}$$

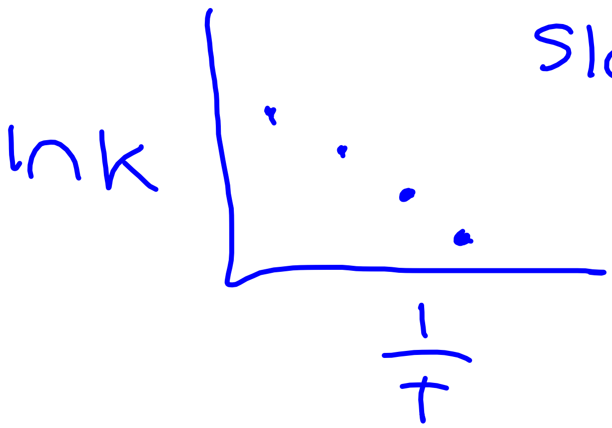
$$\ln k = \ln\left(A \cdot e^{-\frac{E_a}{RT}}\right)$$

$$\ln k = \ln A + \cancel{\ln}\, \cancel{e}^{-\frac{E_a}{RT}}$$

$$\ln k = \ln A - \frac{E_a}{RT}$$

$$\ln k = \ln A - \frac{E_a}{R}\left(\frac{1}{T}\right)$$

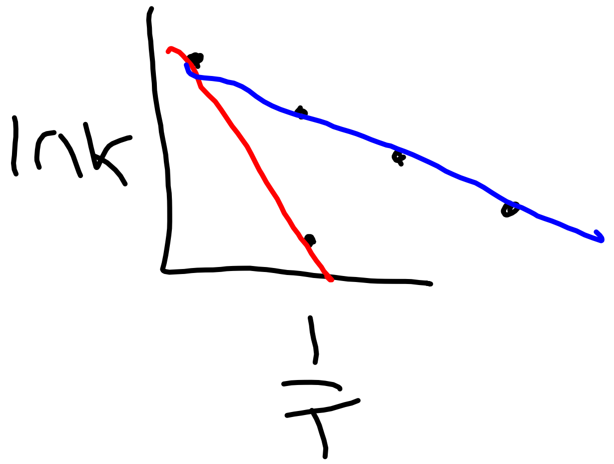
$$y = b + m \cdot x$$



$$\text{slope} = -\frac{E_a}{R}$$

$$\downarrow$$

$$E_a = -R \cdot \text{slope}$$


lnk
1/T

the 2-point Arrhenius equation

$$\ln k = \ln A - \left(\frac{E_a}{R}\right)\left(\frac{1}{T}\right)$$

(T_1, k_1) (T_2, k_2)

$$\ln k_2 = \ln A - \left(\frac{E_a}{R}\right)\left(\frac{1}{T_2}\right)$$

$$-\left[\ln k_1 = \ln A - \left(\frac{E_a}{R}\right)\left(\frac{1}{T_1}\right)\right]$$

$$\ln k_2 - \ln k_1 = \left(\frac{E_a}{R}\right)\left(\frac{1}{T_1}\right) - \left(\frac{E_a}{R}\right)\left(\frac{1}{T_2}\right)$$

$$\ln\left(\frac{k_2}{k_1}\right) = \left(\frac{E_a}{R}\right)\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

2-point Arrhenius Equation

Remember Clausius-Clapeyron?

$$\ln\left(\frac{P_2}{P_1}\right) = \frac{\Delta H_{vap}}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

$$ab - ac = a(b - c)$$

$$2NO_2(g) + F_2(g) \rightarrow 2NO_2F(g)$$

$$R = k[NO_2][F_2]$$

$$NO_2(g) + F_2(g) \xrightarrow{\text{slow}} NO_2F(g) + \cancel{F(g)}$$

$$NO_2(g) + \cancel{F(g)} \xrightarrow{\text{fast}} NO_2F(g)$$

$$2NO_2(g) + F_2(g) \rightarrow 2NO_2F(g)$$