Methylene Glycol Clock Reaction

* Gather Data in Pairs.
* Work calculations & process data separately

Rate Law

$$xA + yB \rightarrow zC + wD$$

$$\text{rate} = k[A]^a[B]^b$$

- Powers are orders of reaction not to be confused with stoichiometric coefficients.
- Overall order is sum.

$$\text{rate} = \frac{d[\text{product}]}{dt} = -\frac{d[\text{reactant}]}{dt} \qquad [\ ] = \frac{\text{moles}}{L}$$

Mechanism

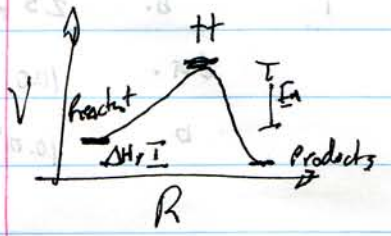
$CH_2(OH)_2 \rightleftharpoons HCHO + H_2O$ — Slowest ⇒ rate determining

$HCHO + SO_3^{2-} \rightleftharpoons H_2CO(SO_3)^{2-}$ — Slow

$H_2CO(SO_3)^{2-} + H^+ \rightleftharpoons H_2COH(SO_3)^-$ — Fast

$HSO_3^- \rightleftharpoons H^+ + SO_3^{2-}$ — Fast

$CH_2(OH)_2 + HSO_3^- \rightleftharpoons H_2COH(SO_3)^-$ — Overall



$$k = Ae^{-E_a/RT}$$

Arrhenius Eq.

A = collision frequency factor

k = specific rate constant

$$\ln k = \ln A - \frac{E_a}{R} \cdot \frac{1}{T}$$

$$pH = pK_a + \log\left(\frac{[\text{base}]}{[\text{acid}]}\right) \quad \frac{[A^-]}{[HA]} \quad \frac{[\text{salt}]}{[\text{acid}]} \quad \frac{[Na_2SO_3]}{[NaHSO_3]}$$

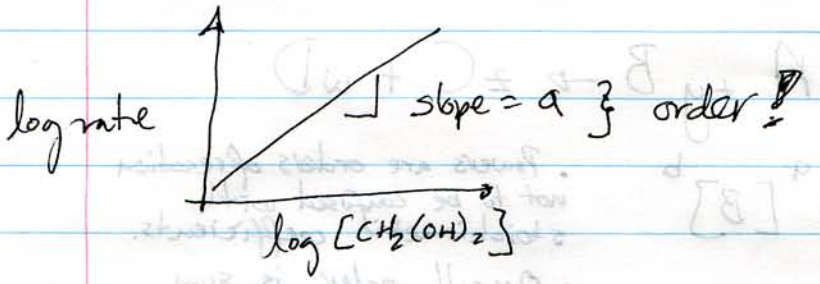
$$\text{rate} = k\,[CH_2(OH)_2]^a\,[NaHSO_3]^b$$

$$\log \text{rate} = \underbrace{\log k}_{\text{constant}} + a \log [CH_2(OH)_2] + b \log [NaHSO_3]$$

constant

initial rates method.

$$\log \text{rate} = a \log [CH_2(OH)_2] + \text{const.}$$



$$\text{rate} = k\,[A]^a\,[B]^b \qquad k = \text{rate} / [A]^a \cdot [B]^b$$

- Do twice
- Try to keep T of sols. constant.
- Reaction under hood.
- 10s - 2 min be ALERT.
- Don't forget phenolphtalein.
- Use white paper under beaker.

- check to see if their books are correct on preparation of samples.

e.g.

	A ($[HSO_3^-]$)	B → glycol
5a.	2.5	10.0
b.	2.5 not 10.0	10.0
6a.	10.0	10.0
b.	10.0 not 7.5	10.0