

1/31/20 Last Day of CH. 14!!

Today: Reaction Mechanisms

Sunday: Problem Club with Kendall

Monday: Review & Catch up

Tuesday: Problem Club with Kendall

Wednesday: Celebration of Knowledge #1!

Class door open @ 9:15 to start

* Dr. Mattson has office hours too!!

check email
for Chem. Student
number

Chapter 14 Theme:

What is rate expression & order?

initial
conc. & initial rate

time-conc.
study

order & rate law

k

Warm-up: What is the rate law & rate constant for the following reaction?



Trial	$[\text{NO}_2]_0$	$[\text{CO}]_0$	Initial Rate
1	0.0446	0.0217	$1.47 \times 10^{-4} \text{ mol/L}\cdot\text{min}$
2	0.0769	0.0217	4.25×10^{-4}
3	0.0769	0.0303	4.25×10^{-4}

~~rate = k~~
 $\text{rate} = k[\text{NO}_2]^{0.112}[\text{CO}]^{0.112}$

info about NO_2

$$\frac{1.47 \times 10^{-4}}{4.25 \times 10^{-4}} = \frac{k(0.0446)^{0.112}}{k(0.0769)^{0.112}}$$

$$0.346 = 0.588$$

rate = $k[\text{NO}_2]^2[\text{CO}]^0$

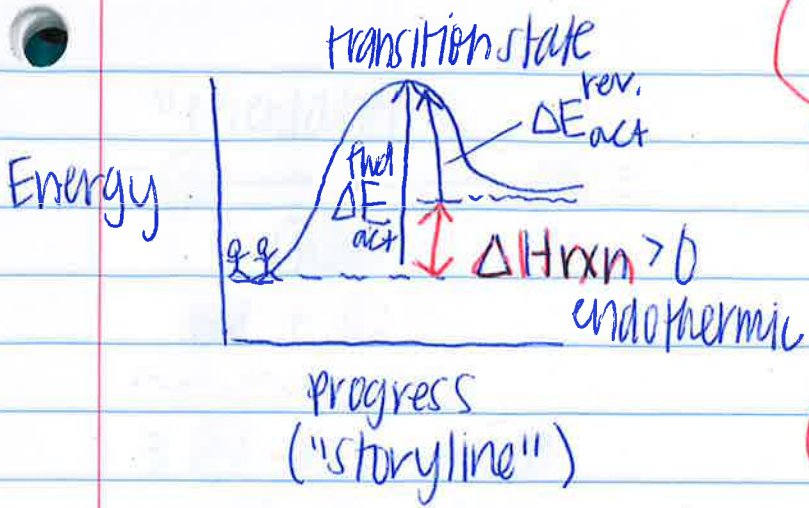
* must be 0, b/c rate between trial 2 & 3

doesn't change

$k = 0.0739 \text{ L/mol}\cdot\text{min}$

plug in numbers

& solve for k



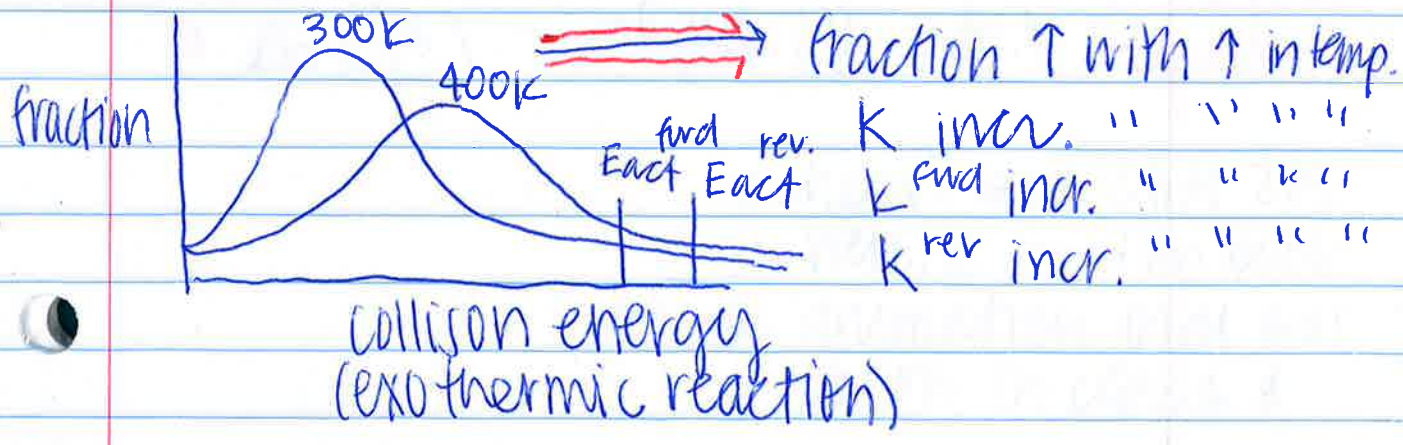
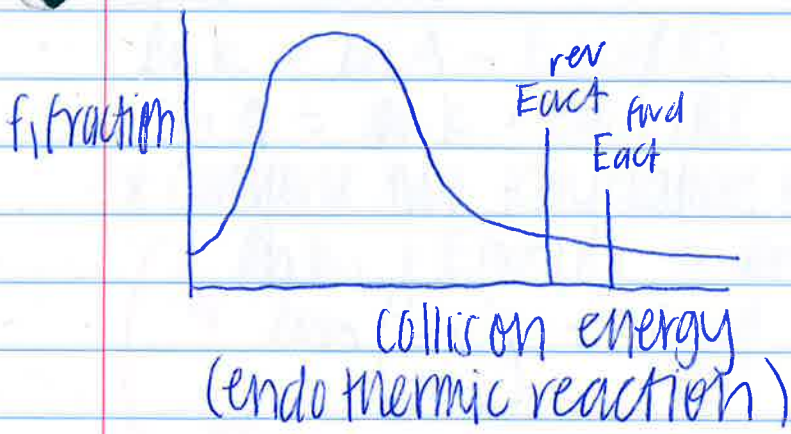
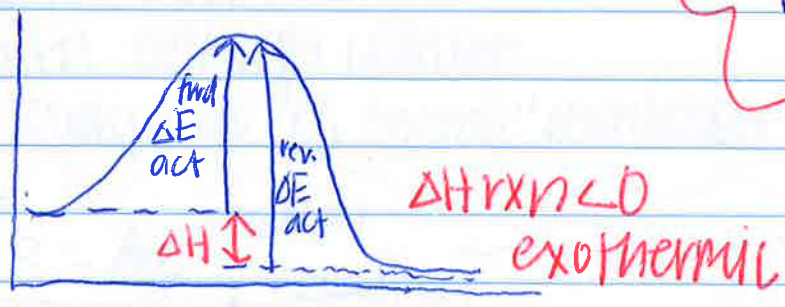
fraction

$$f = e^{-E_{act}/RT}$$

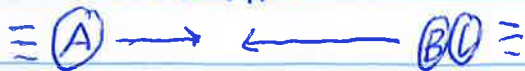
$$k = A e^{-E_{act}/RT}$$

↑
collision frequency & orientation

↳ what is orientation??



"orientation"



* no rxn even
with enough collision
energy b/c of "wrong" orientation

$$k = Ae^{-E_{act}/RT}$$

$$\ln k = \ln A - \frac{E_{act}}{RT}$$

→ working w/erraneous
equation

$$\ln k = \ln A - E_{act}/RT$$

$$\ln A = \ln k + E_{act}/RT$$

* compare two temperatures & k values do this! *

$$\ln k_1 + E_{act}/RT = \ln k_2 + E_{act}/RT_2$$

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

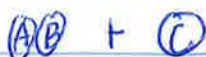
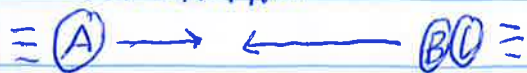
OR

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

} called
erraneous
equation

* check out CHM 205
website for flip book
animation that was
shown in class *

"orientation"



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$$k = Ae^{-E_{act}/RT}$$

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→ working w/erraneous
equation

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