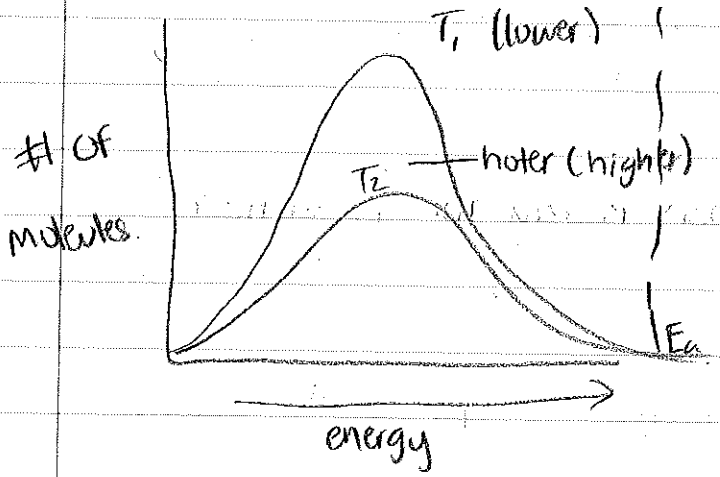
4/4/13

Roll — At given temp. molecules in a sample have distribution of energy.



$T_2 > T_1$

at higher temp. you have enough molecules to cross E_a barrier.

- Arrhenius Law

The rate constant K is a function of temperature.

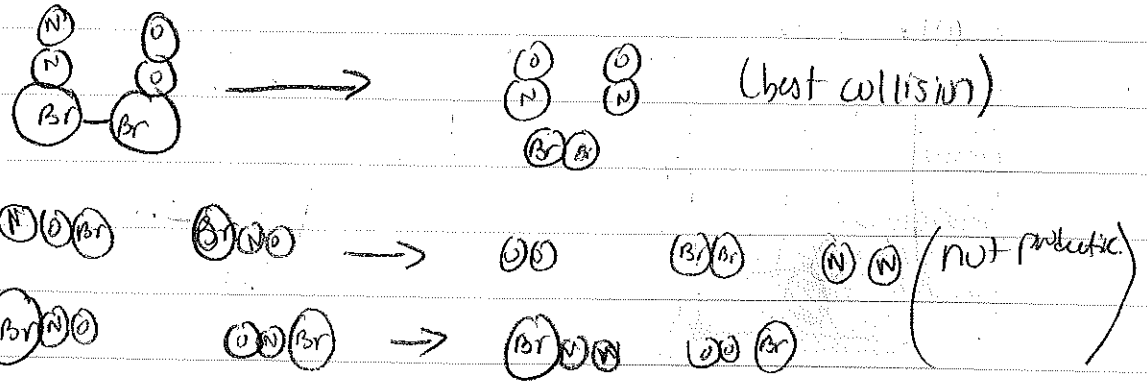
$K = A e^{-E_a/RT}$ (higher temp. rate faster).

A: constant; E_a: activation energy.

The higher temp. the more molecules that have enough energy to make it over barrier.

A term in equation is the rate at infite temp.

(not all interactions between the molecules even with sufficient energy will lead to products.



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

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

$$\ln k = \ln A - E_a/RT$$

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

Poll What is the activation energy for this reaction?

$$\ln k =$$

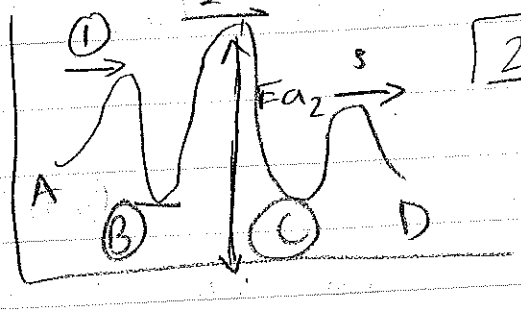
$$\text{Slope} = \frac{\Delta \ln(k)}{\Delta(1/T)} \qquad R = 8.314\ J/mol \cdot K$$

$$M = -1.2 \times 10^4 = \frac{-E_a}{R}$$

$$(1.2 \times 10^4)(8.34)$$

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

Poll Look at following graph. The reaction will have ___ intermediates.



2

Step 2 is slow step.

The step with highest

Poll Which of the following factors that affect the rate of reaction do so by changing the activation energy?

D. Adding a catalyst to the reaction mixture. (gives diff path).

increasing temp. → more molecules overcome same E_a.

increasing surface area → pre exponential factor

increasing concentration → rate (not rate constant)

Decomposition: when I add catalyst.

$H_2O_2 + MnO_2 + 2H^+ \rightarrow Mn^{2+} 2H_2O + O_2$

$Mn^{2+} 2H_2O_2 \rightarrow Mn(OH)_2 + 2H^+$

$Mn(OH)_2 + H_2O_2 \rightarrow MnO_2 + 2H_2O$

catalytic behavior homogeneous. because same.