Rate Note → main points:

Dec. 3rd

Section i)

$$\text{Rate} = \frac{\Delta \text{something}}{\Delta T}$$

helps if you can actually observe it. (i.e. temp)

Relationship between Different Parts of a Rate:

Section ii)

> if measuring a reactant, amount goes down ∴ a negative change.

$$\text{Rate} = \frac{-\Delta \text{Reactant}}{\Delta T} \qquad \text{Rate} = \frac{+\Delta \text{Product}}{\Delta T}$$

> could be more complicated → "think"!
> difficult relationships exsist (unimportant now).

hard question on test!

Average Rate vs. Instantaneous Rates:

Section iii)

> ignore!!

Collision Theory of Reactants:

Section iv)

> all reactions are a result of **BI-MOLECULAR COLLISIONS!** → may be several steps.
> all reactions can be broken down into Bi-molecular sequences, called a reaction mechanism.
> consider a multiple sequence of steps one step is slower than the other & is called the **Rate determining step!**

Collision Theory:

Section v)

Rate = (# of collision per unit time) [#1] × (Fraction of collision that are sucessful) [#2]

Remember this!!!

General Rate equation.

A collision in Detail:

Section vi)

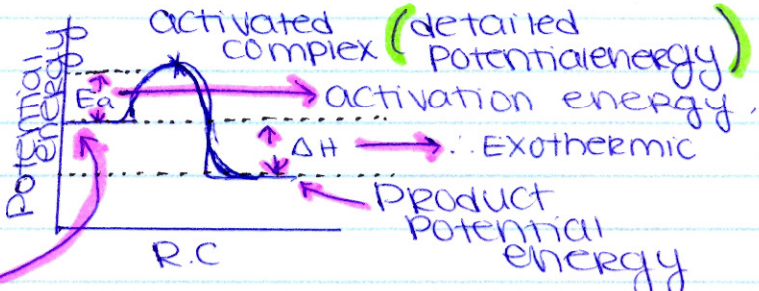
> must have good kinetic energy.

eg. H–Cl + H–Cl becomes H–Cl / H–Cl (activated complex) becomes H–Cl + H–Cl (products!)

> enough energy ✓
> correct geometry ✓

Potential Energy Diagram:

Section vii)



Reactant potential energy

Reaction coordinates (like time)

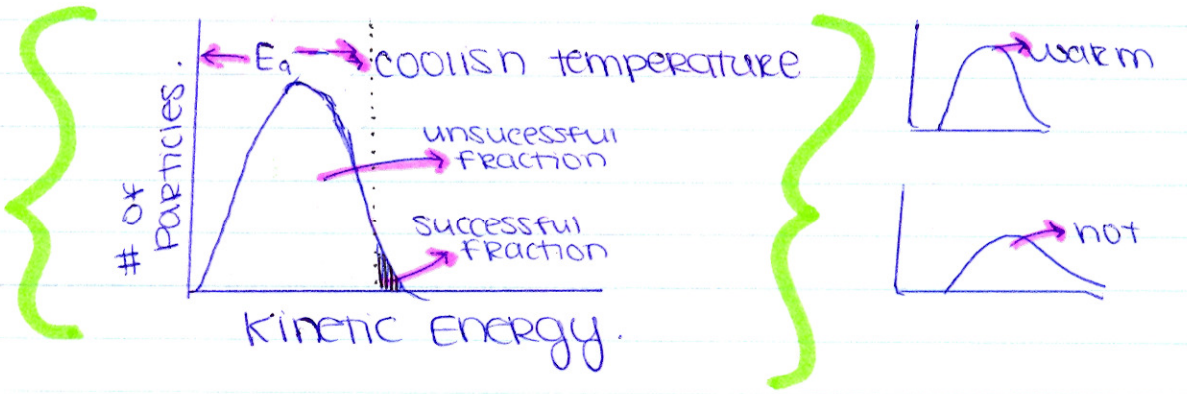
Remember This!!!

> Ea = activation energy, required to overcome repulsion between molecules must come from kinetic energy (particle motion).

Kinetic Energy Distributions

Dec. 3rd.

Section viii)



> catylist can alter the sucessful fraction of the graph which can lower the activation energy.

6 Factors that Effect Reaction Rates

Section ix)

$$\text{Rate} = \left(\begin{matrix}\#1\\ \text{\# of collision per unit time}\end{matrix}\right) \times \left(\begin{matrix}\#2\\ \text{Fraction of collisions that are successful}\end{matrix}\right)$$

① Consideration (#1): higher concentration means more collisions → applicable to solutions & gas phase only.

② Surface area (#1): more surface area makes possible more collisions (think wood)

③ Temperature (#1) & (#2): (#1) → warmer, faster moving ∴ more collisions. (#2) → collisions have more kinetic energy ∴ higher likelihood of exceeding the activation energy barrier (threshold).

④ Catalyst (#2): alternate energy pathways provides a lower activation energy alternative. (more collisions will be able to . . .)

⑤ Nature of Reactants (#2)

⑥ Nature of Reactions (#2)

The more bonds to break, the higher the Ea, the slower the reaction (#2)

> States have an effect (#1)

> Rate Determining Step!

Test on all of this on Thursday.