

Chemical Kinetics

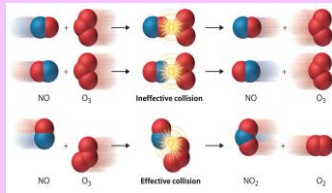
concerned with the rate at which a chemical reaction occurs

Reaction Rate

- Measured by the amount of reactants converted to products over a unit of time
- Rate is not constant
 - usually at a maximum in the beginning, and then decreases over time
- Reactions involving ions usually occur rapidly
- Rate depends on the types of bonds formed, broken

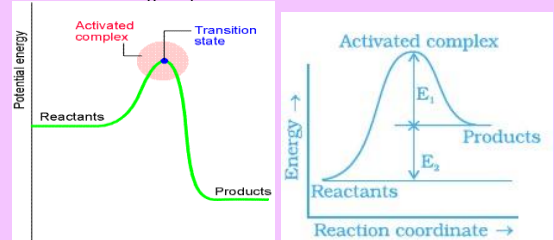
Molecular Collision Theory

- for a reaction to occur, particles must collide
- the greater the collision frequency, the greater the rate
- collisions must be “effective”
 - favorably oriented
 - must have enough energy for bonds to be disrupted
 - activation energy



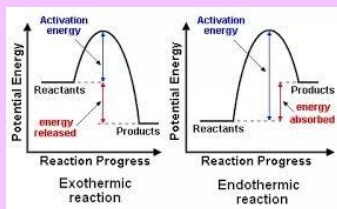
Molecular Collision Theory (cont.)

- Activated complex
 - A transition state
 - At this point, the bonding is disrupted
 - Point with highest energy & lowest stability
 - can change to products or revert to reactants



Molecular Collision Theory (cont.)

- Activation Energy (E_a)
 - The amount of energy needed to reach this point
 - The minimum amount of energy required for an effective collision



Factors Affecting Rate

- Temperature
- Catalyst
- Surface Area
- Concentration



Slow Reaction

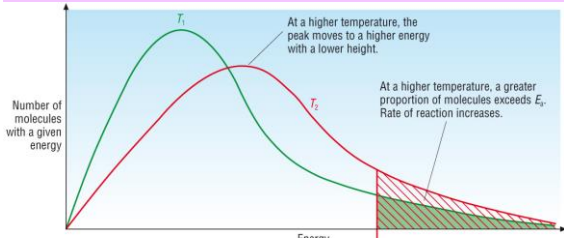
vs.



Fast Reaction

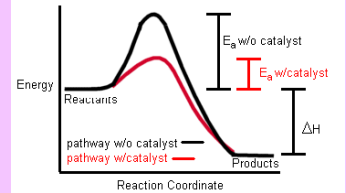
Temperature

- Rates will increase with increasing temperature
 - higher temp, particles move faster, more collisions, faster rate
 - higher temp, more energy, more effective collisions, faster rate



Catalyst

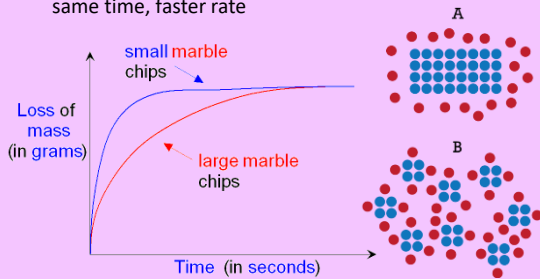
- A substance that increases the rate of reaction
- Provides an alternate pathway (mechanism) with a lower activation energy
- Does not consumed in the reaction (can be reused)
- Enzymes are biological catalysts
- Inhibitors reduce the rate of a reaction



Surface Area

Rates will increase when the surface area increases

- More surface area, more collisions can occur at the same time, faster rate



Concentration

Rates will increase when concentration increases

- Higher concentration, more collisions, faster the rate

