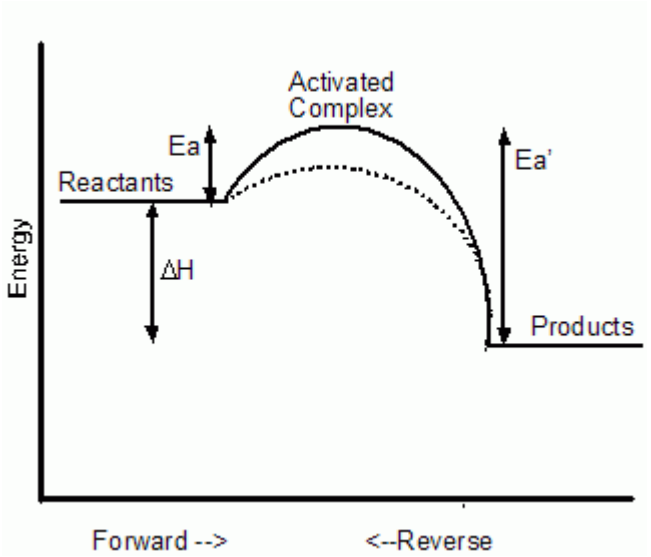
Kinetics and Thermodynamics Organizer

I. Energy Diagrams



Activated Complex	Transitional state that exists between reactants and products as old bonds are broken and new bonds are formed
E_a	Activation Energy. The energy required to convert reactants into the activated complex.
E_a'	Activation energy of the reverse reaction
ΔH	Heat of reaction. The energy released or absorbed as a reaction takes place. Also called ΔE. ΔH is positive for endothermic reactions, and negative for exothermic reactions.
Catalyst	A substance that speeds up the rate of a chemical reaction without itself being permanently changed. The effect of a catalyst is represented on the diagram by the ---------- line.

II. Collision Theory - Molecules must collide in order to react

1. Collisions must be properly oriented
    a. Catalysts improve collision orientation
2. Collisions must have sufficient energy
    a. Heating increases collision energy and collision frequency
    b. Heating <u>does not</u> improve orientation

III. Reaction Rates

1. Reactions proceed by a series of simple steps
2. The rate of the reaction is determined by the <u>slowest</u> step
3. The rate of a reaction can be expressed in several ways:
    a. The rate of disappearance of reactants
    b. The rate of formation of products
4. Increasing reaction rate
    a. Catalysts lower the activation energy by providing an alternate reaction pathway
    b. Heating – Increases the frequency and energy of collisions
    c. Increasing surface area increases reaction rate for solids
    d. Vaporization may increase reaction rate for some liquids, particularly in combustion reactions

IV. Specific Heat

1. Specific heat is the energy required to increase the temperature of one gram of a substance by one degree Celsius
    a. Metals have a characteristically low specific heat (little energy is required to increase their temperature)
    b. Water has a VERY HIGH specific heat (a lot of energy is required to increase its temperature

$$q = c_p \cdot m \cdot \Delta T \qquad c_p = \frac{q}{m \cdot \Delta T}$$