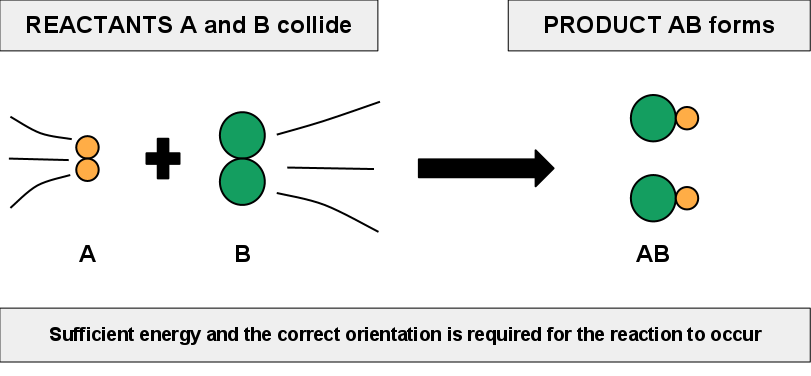
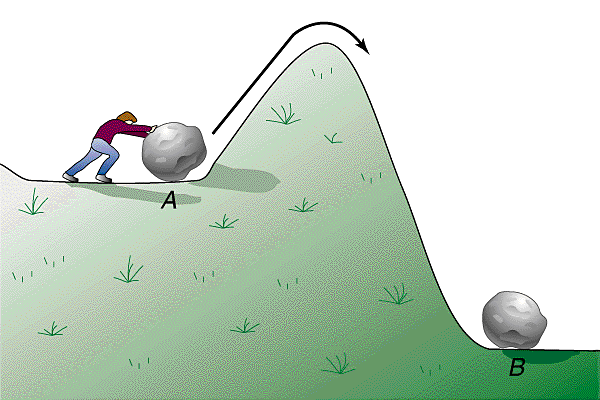
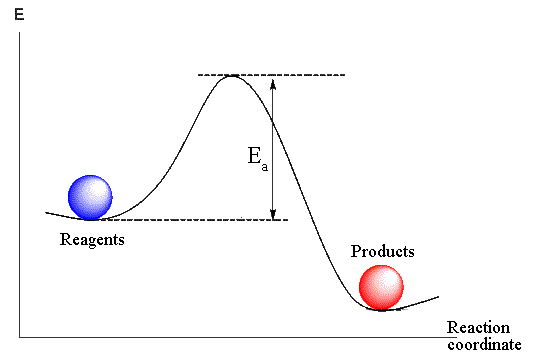
**Notes – Reaction Rates & Equilibrium**

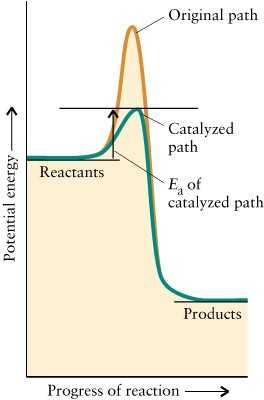
1. **Collision Theory** – Reactions happen when reactants collide or .



1. **Spontaneous reaction** – occurs when the collision is enough that are broken & remade.
2. **Nonspontaneous reaction** – If there is not enough and we have to add some in the form of , , or .
3. There must be enough energy for the reaction to start, called **energy**.

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1. **Reaction Rate** – How fast a reaction moves from reactants to products
   1. What can change the rate of a reaction?
      1. . . the temperature
         1. Why?
      2. Increasing the of reactants
         1. Why?
      3. Adding a **catalyst**
         1. What is a catalyst?
            1. A substance whose mere presence speeds up a reaction without being involved in the reaction at all!



1. **Equilibrium**
   1. **Reversible Reactions** – a reaction that proceed from reactants to products and then reverse and go from products to reactants
      1. 2H2 + O2 → 2H2O **forward reaction**
      2. 2H2 + O2 ← 2H2O **reverse reaction**
      3. Becomes
   2. **Equilibrium** –

**Rate of forward reaction = rate of the reverse reaction**

* 1. **LeChatelier’s Principle –** when a change is forced on the system at equilibrium, the position of equilibrium shifts (to the or to the ) to reduce the effect of the change.
     1. Examples
        1. **N2 (g) + 3H2 (g) ⇄ 2NH3 (g)** 
           1. Which way would equilibrium shift if you

Increased the concentration of N2?

Increased the concentration of NH3?

Reduced the concentration of H2?

* + - 1. **CaCO3 (s) ⇄ CaO (s) + CO2 (g)**
         1. Which way would equilibrium shift if you

Decreased the volume of the container?

Increased the volume of the container?

* + - 1. **N2 (g) + 3H2 (g) ⇄ 2NH3 (g) + 92kJ**
         1. Which way would equilibrium shift if you

Increased the temperature?

Decreased the temperature?

Reduced the concentration of H2?

* + - 1. **CaCO3 (s) + 556kJ ⇄ CaO (s) + CO2 (g)**
         1. Which way would equilibrium shift if you

Increased the temperature?

Reduced the temperature?