Kinetics & Equilibrium

Chemical Kinetics

- The area of chemistry that is concerned with reaction _____ and reaction _____ is called **chemical** _____ .
- The rate of a reaction depends on the collision _____ of the reactants and on the collision efficiency.

Factors that Affect Reaction Rates

1. Nature of the _____
2. _____ of the reactants
3. _____
4. _____
5. _____

Nature of Reactants

- The rate of reaction depends on the particular reactants and bonds involved.
- The more _____ a reactant, the _____ the reaction will proceed

Concentration

- An _____ in rate is expected if the concentration of one or more of the reactants _____ .
- This is due to the increased number of _____
- Higher concentration = more stuff to hit

Surface area

- If the surface area is increased, the are more frequent _____ leading to a faster reaction

Temperature

- An increase in temperature increases the _____ energy of the particles in a substance resulting in a greater number of effective collisions.

Catalyst

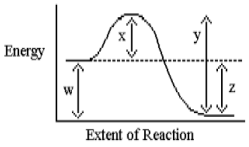
- A _____ is a substance that changes the rate of a chemical reaction without itself being permanently consumed.
- An _____ slows down a chemical reaction without being used up
- A catalyst works by lowering the activation energy of the reaction

Collision Theory

- In order for reactions to occur, 3 things must happen:
  1. Atoms or molecules must _____
  2. The must collide with the proper _____
  3. The must collide with sufficient _____

Activation Energy

- Activation Energy the minimum amount of energy that particles must collide with to make a reaction occur



LeChâtelier's Principle

- Le Châtelier's principle states that if a system at equilibrium is subjected to a stress, the equilibrium is shifted in the direction that tends to relieve the stress.

Concentration

$CO + 3H_2 \leftrightarrow CH_4 + H_2O$

- Which way does the equilibrium shift if [CO] is increased
- Which way does the equilibrium shift if [CH_4] is increased
- Which way does the equilibrium shift if [H_2] is increased
- Which way does the equilibrium shift if [H_2O] is increased

Concentration

$N_2 + 3H_2 \leftrightarrow 2NH_3$

- Add N_2
- Add H_2
- Add NH_3
- Remove N_2
- Remove H_2
- Remove NH_3

Temperature

$CO + 3H_2 \leftrightarrow CH_4 + H_2O \quad \Delta H = -206KJ$

- Increase the temperature
- Decrease the temperature

Volume & Pressure

- When doing volume & Pressure…you look at the number of moles
- $CO + 3H_2 \leftrightarrow CH_4 + H_2O$
- 4 moles 2 moles
- If you decrease the volume (which is increasing the pressure) you are getting cramped & the molecules will want to go to the side with the fewest # of moles)
- If you increase the volume (which is decreasing the pressure) you have room will want to go to the side with the most # of moles)

Volume & Pressure

- $CO + 3H_2 \leftrightarrow CH_4 + H_2O$
- Increase the pressure
- Increase the volume
- Decrease the volume
- Decrease the pressure

Volume & Pressure

- If the number of moles are the same…there will be no change when to the system when volume & pressure are changed.

- $H_2 + I_2 \leftrightarrow 2HI$
- Volume & pressure → no change