Understanding K and Q in CH 223

For the reaction: $\mathbf{a\ A_{(aq)} + b\ B_{(aq)} \Longleftrightarrow c\ C_{(aq)} + d\ D_{(aq)}}$,
the **equilibrium constant, K,** is defined as:

$$\mathbf{K = \frac{[C]^c[D]^d}{[A]^a[B]^b}}$$

If K >> 1, the reaction is product favored

Equilibrium concentrations of products are greater than the equilibrium concentrations of reactants

If K << 1, the reaction is reactant favored

Equilibrium concentrations of reactants are greater than the equilibrium concentrations of products

If K = 1, the concentration of products equals the concentration of reactants

This condition is extremely rare and will not be seen in CH 223.

The **Reaction Quotient, Q,** is used to compare experimental conditions to equilibrium positions.

Q is a **ratio of concentrations** similar to the definition of **K**, above.

The concentrations for **K** should be at equilibrium, while the concentrations given for **Q** *may not* be at equilibrium.

- **If Q > K, the reaction is not at equilibrium,** and the reaction will move to the **reactants**.
- **If Q < K, the reaction is not at equilibrium,** and the reaction will move to the **products**.
- **If Q = K, the reaction is at equilibrium**