Chapter Summary: Chemical Equilibrium

Dynamic Equilibrium: when forward and reverse reaction rates are same.

Equilibrium constant (K_c): mathematical constant particular to a particular reaction.

$K_c = \frac{[\text{products}]^x}{[\text{reactants}]^y}$ (x and y are stoichiometric quotients)

Equilibrium constant can be reversed if the reaction is reversed. If the stoichiometric quotients are changed (i.e. if the equation is multiplied by 2) then K_c can be raised to that number (2) as well so the new $K_c = K_c^2$

For gases = $K_p = K_c (RT)^{\Delta n}$ where n = coefficient.

Reaction Quotient (Q_c): the initial reaction rate of a reaction. Its not a constant but dynamic and the relationship between Q_c and K_c gives the direction of the equilibrium.

If $Q_c = 0$ only reactants are present
If $Q_c < K_c$ then equilibrium is in the forward direction
If $Q_c = K_c$ then reaction is in equilibrium.
If $Q_c > K_c$ then equilibrium is in the reverse direction
If Q_c = infinity then only products are present.

Le Chatlier's Principle: when change in concentration, temperature, pressure or volume occurs on a reaction, the equilibrium shifts to minimize that change.

1) Changing reactants: addition of these should shift equilibrium forward.
2) Removing products: should shift equilibrium forward.
3) Changing pressure or volume: when P is increased (or V is decreased) shift is towards smaller number of moles of gas produced; when P is decreased (or V is increased) equilibrium shifts to the larger number of moles of gas produced; if the number of moles of gas produced is the same then P does not have an effect.
4) Changing the temperature: raising T shifts equilibrium towards endothermic whereas decreasing T shifts equilibrium towards exothermic reaction.
5) Catalyst: no change since both forward and backward reaction rates are increased.