7. Chemical Equilibria

Definitions

Dynamic Equilibrium: Refers to a reversible reaction in which rates of the forward and backward reactions are equal and non-zero and there is no change in the concentrations of the reactants and products.

Le Chatelier's Principle: When a system in equilibrium is subjected to a change, the system responds in such a way as to counter the effect of the change and re-establish the equilibrium state.

- When there are equal number of moles on both sides of the equation, Kc = Kp and both will have no units
- If overall reaction is the sum of 2 or more reactions, overall Kc = K1 x K2 x ...
- Kc is only affected by temperature changes, therefore constant at a specific temperature.
- When inert gas is added at a constant volume, although the total pressure of the system increases, the partial pressures of the reactants and products remain unchanged and thus equilibrium position is not affected.
- When inert gas is added at a constant pressure, total volume of the system is increased and the partial pressures of the reactants and products decreases, hence equilibrium positions shifts to counter the decrease in pressure.
- When temperature is increased, the rate constants of both the forward and backward reactions increase since k = Ae^-Ea/RT. Furthermore, the number of particles with energy greater or equal to the activation energy increases and hence dynamic equilibrium is reached more quickly.
- Catalyst has no effect as it lowers the activation energy of both forward and backward reactions to the same extent and hence both reactions are increased to the same extent. However catalyst does increase the rate of reaction thus reaching dynamic equilibrium faster.

Questions

1. Explain why the calculated value of Kc may not be accurate.

Ans: When _____ was added to remove _____, the eqm position shifted to the left and hence the concentration of _____ determined was actually greater than the actual concentration at eqm.