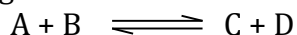


Chapter Summary: Chemical Equilibrium

Dynamic Equilibrium: When forward and reverse reaction rates are same. Note the reaction arrow is going both forward and reverse.



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

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

Manipulation of K_c : 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 squared so the new $K_c = K_c^2$.

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

Reaction Quotient (Q_c): Equilibrium is not constant but dynamic and the relationship between Q_c and K_c gives the direction of the equilibrium. Q_c is calculated the same way as K_c .

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

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.

Key Words

Equilibrium constant for gases and aqueous reactions	Reaction quotient (Q_c)	Le Chatlier's Principle
Manipulation of K_c		