

Review for Second Exam:

Chapter 15

Definition of equilibrium; equilibrium as a dynamic process

Equilibrium constant; K_C and K_p ; significance of the equilibrium constant

Properties of equilibrium constant

- Lack of units for K_C and K_p
- Relationship between K_C and K_p
- Relationship between K and the way a reaction is written
- Things that do not appear in K (solids, pure liquids, solvents)

Finding numerical values for K

Using K to find equilibrium concentrations

- ICE method (initial, change, equilibrium)
- Quadratic equation; quadratic formula
- Conditions where x in ICE method can be assumed small

Trends in K ; equilibrium when $K \gg 1$ or $K \ll 1$

Reaction quotient (Q); definition, relationship between Q and K

Use of reaction quotient to predict how systems will approach equilibrium

Le Chatelier's principle and its applications

Definition of the thermodynamic reaction quotient (Q) and equilibrium constant (K)

Free energy change for non-standard conditions

Use of thermodynamic data to find the value for K (equilibrium constant)

Temperature dependence of K

Chapter 16

Arrhenius definition of acids and bases

Bronsted definition of acids and bases; acid/conjugate base and base/conjugate acid pairs

Finding the conjugate acid and conjugate base for a substance

K_a (acid ionization constant) and K_b (base ionization constant)

Amphoteric substances; definition and examples

The seven strong acids; strong and weak acids

The eight strong soluble bases; insoluble bases; weak bases

Comparing relative strengths of weak acids or weak bases

Autoionization of water; K_w ; $[H_3O^+]$ and $[OH^-]$ for neutral solutions at $T = 25^\circ C$

Acid, basic, and neutral solutions

pH; definition and calculation; relationship between pH and $[H_3O^+]$

pOH and pK; relationship between pH, pOH, and pK_w

pH and pOH for strong acids and strong bases

pH and pOH for weak acids and weak bases using the ICE method

Percent dissociation; definition and calculation

Polyprotic acids; definition; K_{a1} , K_{a2} , ..., calculations for polyprotic acids

Relationship between K_a and K_b for acid/base pairs

Relative strengths of acids and conjugate bases, or bases and conjugate acids

Acid-base properties of salts; strong acid-strong base, strong acid-weak base, weak acid-strong base, and weak acid-weak base salts

pH calculations for salts

Acid-base properties of metal oxides and nonmetal oxides

Cations as weak acids; relationship between size, charge, and weak acid strength for cations

Trends in acid strength; explanation of observed trends

Lewis acids and Lewis bases; definition; identification