Chapter 8 Solutions, Acids & Bases

Dissolving: Dissociation, Dispersion or Ionization

Substances can dissolve in water by three ways:

1. dissociation
2. dispersion
3. ionization

Dissociation is the process by which an ionic compound separates into ions

Ex: NaCl

Dispersion is the process by which a compound breaks into small pieces that spread throughout the water

Ex: sugar dissolves in water

Ionization is the process by which neutral molecules gain or lose electrons (forming ions)

Ex: hydrogen chloride gas & water react to form hydronium ion (H_3O^+) and chlorine ion (Cl^-)

Physical Properties: Solute & Solvent

- A solute is a substance whose particles are dissolved in a solution (often a solid)
- A solvent is the substance in which the solute dissolves (often a liquid)
- Solutes and solvents can take the form of solids, liquids or gases
- The solution takes the state of the solvent

- Conductivity is the ability of a solution to conduct electricity
- Ex: NaCl is a poor conductor until it is placed in water & dissociates

Energy Changes & Solution Formation

- During formation of a solution, energy is either released or absorbed
- The process is endothermic or exothermic
- Forming attractions releases energy (exothermic)
- Breaking attractions requires or absorbs energy (endothermic)

Factors that Affect Dissolving Rate

- Factors that affect the rate of dissolving include surface area, stirring and temperature
- Dissolving takes place at the surface
- The greater the surface area, the faster the dissolving
- Stirring or shaking makes a substance dissolve faster by increasing the surface area exposed to the solvent

Solubility & Factors Affecting Solubility

- Solubility is the maximum amount of a solute that dissolves in a given amount of solvent at a constant temperature
- Solutions are classified as saturated, unsaturated or supersaturated
- The classification depends on the amount of solute in solution

3 types of solutions

- A saturated solution is one that contains as much solute as the solvent can hold at a given temperature
- An unsaturated solution has less than the amount of solute that can be dissolved
- A supersaturated solution contains more solute than the solution can normally hold at a given temperature

Acids

- An acid is a compound that produces hydronium ions (H_3O^+) when dissolved in water
- Some general properties of acids include sour taste, reactivity with metals, and ability to produce color changes in indicators
- An indicator is any substance that changes color in the presence of an acid or a base

Bases

- A base is a compound that produces hydroxide ions (OH-) when dissolved in water
- Some general properties of bases include bitter taste, slippery feel, and ability to produce color changes in indicators

Strength of Acids and Bases

- pH of a solution is a measure of its hydronium ion concentration

- A pH of 7 indicates a neutral solution
- Water is the standard for pH 7
- The pH scale runs from 0 – 14
- The lower the pH, the higher the higher the hydronium ion concentration

- The higher the hydronium ion concentration, the more acidic the substance is
- A high pH value means a low H_3O^+ concentration
- The lower H_3O^+ concentration, the more basic or alkaline the solution is