Chapter 3

Acids, Bases, and Solutions

Chapter 3 Project

Turn to page L-79 in your textbook and start the chapter 3 project.

Discover Activity

- Turn to page 80-L in your textbook

Solutions and Suspensions

- Suspension: A mixture in which particles can be seen and easily separated by settling or filtration

- Solution: A well-mixed mixture
  - Cannot see individual particles
  - Can usually be separated by evaporation

Solvent vs. Solute

- Solvent: The part of the solution present in the largest amount – It dissolves the other substance

- Solute: The part of the solution present in the smaller amount – It is dissolved by the solvent
- EX: Salt water – which is the solvent and the solute?

Solutions without water

- Many solutions are made with solvents other than water
  - EX - Gasoline
- A solution can be made of any combination of gases, liquids or solids

Particles in a solution

- Whenever a solution forms, particles of the solute leave each other and become surrounded by particles of the solvent.

Ionic Solids in Water

- Figure 4, pg. 82-L
- Ions are attracted to polar water molecules
- Water molecules surround each ion as it leaves the crystal

Molecular Solids in Water

- Molecular solids break into individual *neutral* particles when dissolved in water.
- Each particle is then surrounded by water molecules

Solutions and Conductivity

- Ionic compounds dissolved in water conduct electricity
  - EX: Salt water
- Molecular compounds dissolved in water do NOT conduct electricity
  - EX: Sugar water

Concentration

- Dilute Solution: Only a little solute is dissolved
- Concentrated Solution: More solute is dissolved

Concentration Example

- Which is concentrated and which is dilute?

Solubility

- Solubility: A measure of how well a solute can dissolve in a solvent at a given temperature

- Saturated Solution: No more solute can dissolve in the solution
- Unsaturated Solution: More solute can dissolve in the solution
- Solubility can be used to identify a compound

Changing Solubility

- Solubility changes when conditions change.
- Temperature has a big impact on the solubility of a solution

- Solids become less soluble as the temperature of the solvent *decreases*
- Gasses become less soluble as the temperature of the solvent *increases*

- Solutes lower the freeing temperature of a solution and raise the boiling temperature of a solution
- EX: Salt in water

Sharpen Your Skills

- Turn to pg. L-85
- Complete the activity on a piece of notebook paper

Discover Activity

- Turn to pg. 90-L
- Complete the activity with your group

Acids

- Acids share some common properties
  - Taste sour, react with metals and carbonates, turn litmus paper red (ours – yellow)

Bases

- Bases share some common properties:
  - Tastes bitter, slippery feel, do not react with metals, turns litmus paper blue (ours, too)

Acid Formulas

- Hydrochloric acid – HCl
- Nitric Acid – HNO_3
- Sulfuric Acid – H_2SO_4
- Acetic Acid – $HC_2H_3O_2$

- What do these have in common?
- Acids are made of one or more H atoms and one negative ion

Acids in Solutions

- Acids in water separate into H ions and negative ions

Water

$HCl \rightarrow H^+ + Cl^-$

- An acid is any substance that produces H ions in water

Bases in a Solution

- Many bases are made of metals combined with hydroxide ions (OH^-)
- Positive metal ions separate from OH^- when dissolved in water

- A base is any substance that produces hydroxide ions in water

Water

$NaOH \rightarrow Na^+ + OH^-$

- Not every base contains hydroxide ions, but they ALL react with water to form OH^- ions

Water

$NH_3 + H_2O \rightarrow NH_4^+ + OH^-$

Strengths of Acids and Bases

- Acids and bases may be strong or weak
- Strength refers to how well the acid or base produces ions in water

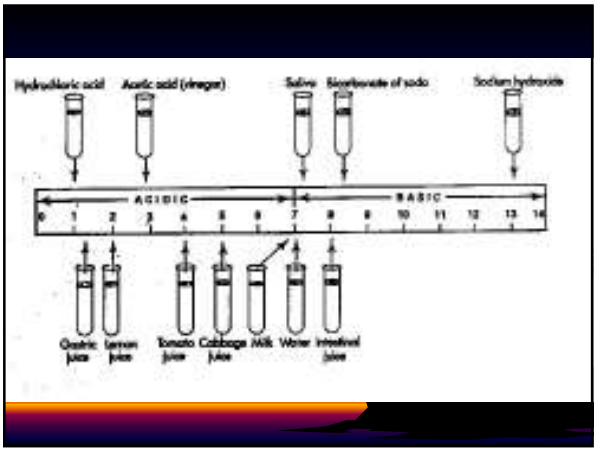
Measuring pH

- The concentration of H ions is the key to how acidic or basic a solution is
- pH Scale: A range of values from 0 to 14 that expresses the concentration of H ions in a solution

- A low pH tells you that the concentration of H ions is high
- A high pH tells you that the concentration of H ions is low

pH Scale

- pH lower than 7 = acidic
- pH higher than 7 is basic
- Picture on pg. L-99



Acid Base Reactions

- When acids and bases react, they produce a neutral solution
- EX: HCL + NaOH → H_2O + Na^+ + Cl^-
- Called Neutralization

Salts

- Salt: Any ionic compound made from the neutralization of an acid with a base
- Made from the positive ion of a base and the negative ion of an acid

Digestion

- Foods must be broken down into simpler substances that your body can use for raw materials
- Digestion: Breaks down complex food molecules into smaller molecules

- Mechanical Digestion: Tears, grinds and mashes large food molecules into smaller ones
- Chemical Digestion: Food is broken down and changed into other compounds