

Chapter 5 Mixtures, Solubility, and Acid / Base Solutions

- 5-1 • Substance - matter that is always made up of the same combination of atoms.

ie: substance $\begin{cases} \rightarrow \text{elements} \\ \rightarrow \text{compounds} \end{cases}$

- Mixture - 2 or more substances physically combined (NOT chemically bonded)

ie: air $\begin{cases} \rightarrow 78\% \text{ N} \\ \rightarrow 21\% \text{ O} \\ \rightarrow 1\% \text{ other substances} \end{cases}$

- Mixtures can be heterogeneous $\left\{ \begin{array}{l} \text{unevenly} \\ \text{mixed} \end{array} \right.$
or homogeneous $\left\{ \begin{array}{l} \text{evenly} \\ \text{mixed} \end{array} \right.$

- * Homogeneous mixtures are solutions
- * Liquids and gases can be solutions

- Substances in a mixture keep their own properties. ie: iced tea
- Because substances in a mixture are not bonded together, they can be separated.
- The elements in a compound are chemically bonded. The compound will have its own unique properties and require a chemical change to break the bonds.

5-2 Solutions have 2 parts:

- 1) Solvent \rightarrow substance that makes up the greatest quantity
- 2) Solute \rightarrow all other substances in the solution

Examples of Solutions:

Solid - brass (Cu and Zn)

Liquid - Coke[®] (H_2O , CO_2 , $C_{60}H_{12}O_6$ and flavorings)

Gas - Neonatal Incubator Atmosphere (91% O_2 , 9% N_2)

Water is the Universal Solvent...

it dissolves more substances than anything else!

- Water is polar: each molecule has a negative end and a positive end
 - Water dissolves polar liquids
 - Water dissolves ionic compounds

Concentration - the amount of a particular solute in a given solution.

Dilute - "less concentrated"

$$\text{Concentration} = \frac{\text{mass of solute}}{\text{volume of solution}}$$

This is for
a Solid in
a liquid

5-2 continued

Now for solutions of liquids and gases...

$$\text{Concentration} = \frac{\text{Volume of solute}}{\text{Volume of solution}}$$

These must be in the same units!

Then changed to percent!

Solubility - the maximum amount of solute that can dissolve in a given amount of solvent at a certain temperature and pressure

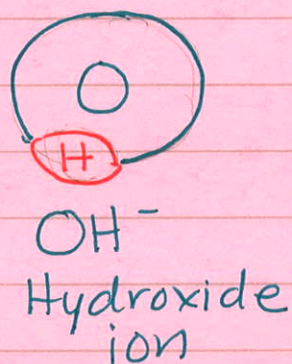
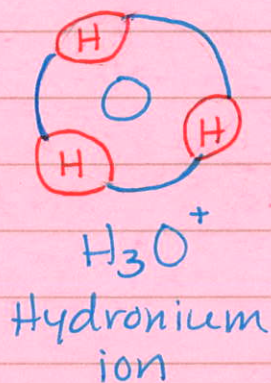
- Saturated solution - contains the maximum amount of solute at a given temperature and pressure
- Unsaturated solution - you can add more solute to the solvent

	Effect on solid/liquid	Effect on gas/liquid
Increasing Temperature	Usually increases solubility	Decreases the solubility
Increasing Pressure	No effect	Increases the solubility
Stirring	Particles dissolve faster	Gas wants to come out of the solution

5-3 Acids and Bases

Acid - a substance that produces a hydronium ion (H_3O^+) when dissolved in water

Base - a substance that produces a hydroxide ion when dissolved in water (OH^-)



- Sour taste in foods
- React w/ some metals to form hydrogen gas
- Can conduct electricity in water
- Bitter taste in foods
- Slippery when wet ☺
- Can conduct electricity in water

pH - an inverse measure of the concentration of hydronium ions in a solution

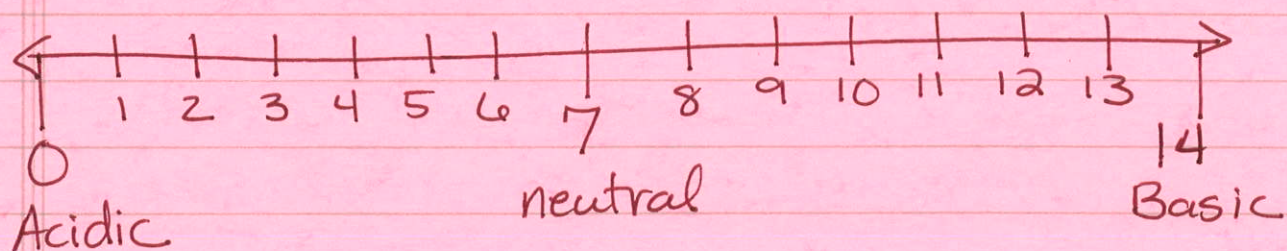
In other words - the more hydronium ions, the lower the pH!

5-3 continued

Acids $\text{H}_3\text{O}^+ > \text{OH}^-$

Neutral $\text{H}_3\text{O}^+ = \text{OH}^-$

Bases $\text{H}_3\text{O}^+ < \text{OH}^-$



* A change in number on the pH scale represents a 10-fold change in hydronium/hydroxide ions!

We measure pH by:

- using indicator strips that change color at different pH values

- using a pH meter with an electrode that is sensitive to the hydronium ion concentration