**Introduction to Acids & Bases**

What are Acids?

* chemical compounds made up of a hydrogen cation and a non-metallic anion or polyatomic ion (e.g. HCl, HNO3)
* sour-tasting (if edible), corrosive, water-soluble substances
* good conductors of electricity
* wear away metals and give off hydrogen gas while the metal is changing
* when dissolved in water, they release hydrogen ions (H+)

Hydrochloric acid dissolved in water

HCl (aq) → H+(aq) + Cl-(aq)

* the more hydrogen ions (H+) present, the stronger the acid

What are Bases?

* chemical compounds made up of a metallic cation and a hydroxide anion (e.g. NaOH, KOH)
* bitter-tasting (if edible), slippery (if safe to touch), corrosive, water-soluble substances
* good conductors of electricity
* when dissolved in water, they release hydroxide ions (OH-)

Sodium hydroxide dissolved in water

NaOH (aq) → Na+(aq) + OH-(aq)

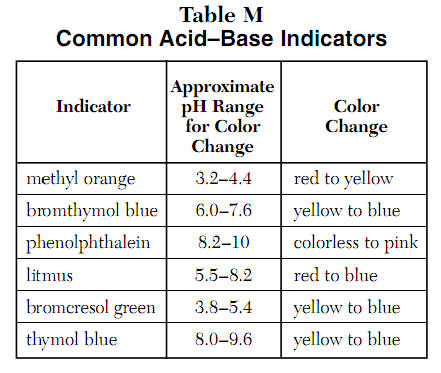
* the more hydroxide ions (OH-) present, the stronger the base
* while most bases contain the hydroxide ion (OH-), others contain the bicarbonate (CO3-2) group or the sulfite group (SO3-2) – really any group that will react with water to form hydroxide ions

The pH Scale

* is a scale from 0 to 14 that represents how acidic or basic a solution is
  + a very acidic solution has a low pH
  + a neutral solution has a pH of 7
  + a very basic solution has a high pH
* pH stands for the power of hydrogen – that is, the concentration of hydrogen ions in solution
* the scale is logarithmic, meaning that every change of one unit on the scale represents a ten-fold change in concentration (101)
  + a solution with pH 3 is 10 times more acidic than a solution with pH 4
  + a solution with pH 13 is 100 times (10 x 10) more basic than a solution with pH 11

Indicators

* chemical substances which change color when in the presence of an acid or a base
* include litmus paper, red cabbage juice, phenolphthalein, methyl orange, congo red, bromthymol blue
* Litmus paper comes in two colours: red and blue. Acid turns blue litmus paper red. Bases turn red litmus paper blue.



Neutralization Reactions

* When an acid and base are combined, they neutralize each other. That is, the solution contains equal number of H+ and OH- ions.
* The products of a neutralization reaction (the combination of an acid and a base) are a salt and often water.
* Neutralization is a double-displacement reaction where an acid is neutralized by a base or vice versa.

Hydrochloric acid + Sodium Hydroxide → Sodium Chloride + Water

HCl (aq) + NaOH(aq) → NaCl (aq) + H2O (l)

* During a neutralization reaction, the hydrogen ion from the acid reacts with hydroxide ion from the base:

H+ + OH- → H2O

* To determine when neutralization has taken place, an indicator is often used.

Acid-Base Reactions in the Home

* In order to make muffins, breads, cakes, and other baked goods rise, baking soda (NaHCO3) is often used. Baking soda is a base that reacts with acids such as vinegar, lemon juice, yogurt, or sour cream to produce carbon dioxide bubbles and make the batter rise.
* Our stomachs contain hydrochloric acid and sometimes, too much acid produces pain and discomfort. An antacid tablet is a very mild base that neutralizes the acid and relieves pain.