ACIDS AND BASES

ACIDS:
l. taste sweet or sour
2. changes blue litmus paper red
3. all acids have H^{+1} ions or hydronium (H_3O^{+1})
4. corrosive to metals
5. neutralize bases

ex: sulfuric acid (batteries), HCl (gastric juice), acetic acid (vinegar)

BASES:
l. taste bitter
2. changes red litmus paper blue
3. all bases have OH^{-1} ions
4. neutralize acids
5. slippery

ex: ammonium hydroxide (oven cleaner), magneusium hydroxide (MOM), sodium hypochlorite (bleach)

HOW DO YOU ID AN ACID OR BASE?

Indicators:
l. litmus paper (hydrion paper)
2. natural - red cabbage, rose petals, etc.
3. weak organic acids:
phenolphthalein (phth) - subtance that turns a solution pink (base) or colorless(acid).

pH scale: used to measure pH (range 0-14)

HOW DO ACIDS AND BASES FORM?

Hydrogen Ions from water -
Reaction in which 2 water molecules give ions is SELF IONIZATION.
(Water molecules are in constant motion even at room T)

$$H_2O \text{ <------> } \underset{\text{hydronium}}{H_3O^{+1}} + \underset{\text{hydroxide}}{OH^{-1}}$$

$[H_3O^{+1}]$ has a shortcut ---> $[H^{+1}]$

In pure water $[H^{+1}] = [OH^{-1}]$ There concentrations both are 1×10^{-7} M

They are *inversely proportional* to each other.

K_w (ion-product constant for water)
K_w always = 1×10^{-14} M when water dissociates.

$$\mathbf{K_w = \frac{[H^{+1}]\ x\ [OH^{-1}]}{[\ H_2O]}}$$ **equilibrium expression**

pH concept

$[H^{+1}]$ in M is cumbersome, so pH scale is used.

$pH = -\log [H^{+1}]$

pH = 0 (very acidic) pH = 7 (neutral) pH = 14 (very alkaline or basic)

BRONSTED-LOWRY ACIDS AND BASES

Theory - written by two Englishmen (Bronsted and Lowry)
Defined as: acid - H^{+1} ion donor
base - H^{+1} ion acceptor

conjugate acid (CA)- particle formed when a base accepts a H^{+1} ion.

conjugate base (CB) - particle that remains when an acid has donated the base (CB) - particle that remains when an acid has donated the H^{+1} ion.

Conjugate acid-base pair: related by acceptance or donation of a single H^{+1} ion.
bronsted-lowry acid/conjugate base
bronsted-lowry base/conjugate acid

amphoteric - ex. water
-acts as an acid and base

STRENGTHS OF ACIDS AND BASES

strong acid/base - completely dissociates in solution
weak acid/base - slightly dissociates in solution

K_a = fraction of acid that is ionized
weak K_a = small K_a (weak acid)
strong K_a = large K_a (strong acid)

K_b = fraction of base that is ionized.
weak K_b --> small K_b
strong K_b --> large K_b