Acids & Bases

· Definitions

Arrhenius Acid
substance that releases H^+ ions in solution

Ex) $HCl(aq) \rightarrow H^+(aq) + Cl^-(aq)$

$H_2SO_4(aq) \rightarrow H^+(aq) + HSO_4^-(aq)$

$HSO_4^-(aq) \rightarrow H^+(aq) + SO_4^{2-}(aq)$

Arrhenius Base
substance that releases OH^- ions in solution

Ex) $KOH(aq) \rightarrow K^+(aq) + OH^-(aq)$

$Ba(OH)_2(aq) \rightarrow Ba^{2+}(aq) + 2OH^-(aq)$

Bronsted-Lowry Acid
substance that donates H^+ ions in solution

· All acids have a conjugate base - substance that remains after the acid has donated an H^+

Bronsted-Lowry Base
substance that accepts H^+ ions in solution

· All bases have a conjugate acid - substance the base becomes after accepting an H^+.

Ex) $\underset{A}{HSO_4^-(aq)} + \underset{B}{F^-(aq)} \rightarrow \underset{CB}{SO_4^{2-}(aq)} + \underset{CA}{HF(aq)}$

Ex) $\underset{B}{NH_3(aq)} + \underset{A}{H_2O(l)} \rightarrow \underset{CA}{NH_4^+(aq)} + \underset{CB}{OH^-(aq)}$

Ex) $\underset{A}{HNO_3(aq)} + \underset{B}{H_2O(l)} \rightarrow \underset{CB}{NO_3^-(aq)} + \underset{CA}{H_3O^+(aq)}$

Amphoteric Substance - one that can act as either an acid or a base.

Ex) $\underset{A}{HCO_3^-(aq)} + \underset{B}{Cl^-(aq)} \rightarrow \underset{CB}{CO_3^{2-}(aq)} + \underset{CA}{HCl(aq)}$

Ex) $\underset{B}{HCO_3^-(aq)} + \underset{A}{NH_4^+(aq)} \rightarrow \underset{CA}{H_2CO_3(aq)} + \underset{CB}{NH_3(aq)}$

- **Strength of Acids & Bases** - refers to the extent the compound breaks apart into ions, not how much damage it can do.

Strong acids/bases
break apart (ionize) 100% into ions.

ex) $H_2SO_4(aq) \rightarrow H^+(aq) + HSO_4^-(aq)$
0% 100%

7 strong Acids - memorize!
1) hydrochloric acid HCl
2) hydrobromic acid HBr
3) hydroiodic acid HI
4) nitric acid HNO_3
5) chloric acid $HClO_3$
6) percloric acid $HClO_4$
7) sulfuric acid H_2SO_4

8 strong Bases - memorize!
1) lithium hydroxide $LiOH$
2) sodium hydroxide $NaOH$
3) potassium hydroxide KOH
4) rubidium hydroxide $RbOH$
5) cesium hydroxide $CsOH$
6) calcium hydroxide $Ca(OH)_2$
7) strontium hydroxide $Sr(OH)_2$
8) barium hydroxide $Ba(OH)_2$

weak acids/bases
less than 10% breaks apart (ionizes) into ions

ex) $HC_2H_3O_2(aq) \rightarrow H^+(aq) + C_2H_3O_2^-(aq)$
90 or more % 10% or less

- **Properties**

Acids
- taste sour
- electrolytes
- turn blue litmus paper red
- react w/metals to produce $H_2(g)$
($H_2SO_4(aq) + Mg(s) \rightarrow H_2(g) + MgSO_4(aq)$)
- react w/bases to produce a salt and water

Bases
- taste bitter
- electrolytes
- turn red litmus paper blue
- react w/acids to produce a salt and water

$HNO_3 + KOH \rightarrow H_2O + KNO_3$