Acids and Bases – Notes

Anhydrous

- without water

Basic Anhydride

- Substance that produces a base in water
- Generally a metallic oxide
    - $Na_2O + H_2O \rightarrow 2NaOH$
    - $CaO + H_2O \rightarrow Ca(OH)_2$

Acidic Anhydride

- Substance that produces an acid in water
- Generally a non-metallic oxide
    - $CO_2 + H_2O \rightarrow H_2CO_3$
    - $SO_2 + H_2O \rightarrow H_2SO_3$
    - $SO_3 + H_2O \rightarrow H_2SO_4$
    - $N_2O_5 + H_2O \rightarrow 2HNO_3$
    - $NO_x + H_2O \rightarrow HNO_3 + HNO_2$

$\Big\}$ Source of Acid Rain

Neutralization Reactions

- Acid + Base → Salt + Water
    - $HCl + NaOH \rightarrow NaCl + H_2O$
    - $H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O$

Hydrolysis Reaction

- The reaction of a salt with water to produce an acidic or basic solution.
- Salt + Water → Acid + Base

    - $NaCl + H_2O \rightarrow HCl + NaOH$

      $\downarrow \quad \downarrow$ (strong acid + strong base)

      $H^+ + Cl^- \quad Na^+ + OH^-$

      $[H^+] = [OH^-]$, $\therefore$ the solution is neutral and hydrolysis does not occur.

    - $NaC_2H_3O_2 + H_2O \rightarrow HC_2H_3O_2 + NaOH$

      $\downarrow\uparrow \quad \downarrow$ (weak acid + strong base)

      $H^+ + C_2H_3O_2^- \quad Na^+ + OH^-$

      $[H^+] < [OH^-]$, $\therefore$ the solution is basic and hydrolysis does occur.

    - $Zn(NO_3)_2 + 2H_2O \rightarrow 2HNO_3 + Zn(OH)_2$

      $\downarrow \quad \downarrow\uparrow$ (strong acid + weak base)

      $2H^+ + 2NO_3^- \quad Zn^{2+} + 2OH^-$

      $[H^+] > [OH^-]$, $\therefore$ the solution is acidic and hydrolysis does occur.

Naming Acids: The formula of an acid is one or more hydrogens bonded to a monatomic or polyatomic anion. The way that the acid is named is determined by the suffix of the anion.

hydrogen _______ide	becomes	hydro	_______ic acid
hydrogen _______ate	becomes		_______ic acid
hydrogen _______ite	becomes		_______ous acid

examples:	HCl	hydrogen chlor**ide**	becomes	**hydro**chlor**ic** acid
	$HClO_4$	hydrogen perchlor**ate**	becomes	perchlor**ic** acid
	$HClO_3$	hydrogen chlor**ate**	becomes	chlor**ic** acid
	$HClO_2$	hydrogen chlor**ite**	becomes	chlor**ous** acid
	$HClO$	hydrogen hypochlor**ite**	becomes	hypochlor**ous** acid