5.1 Acids and Bases

- **Acids** and **bases** are very common.
- Acids and bases can be very **dangerous and corrosive**!
  - **NEVER** try to identify an acid or base by taste or touch!

pH Scale

- The strength of acids and bases is measured on the pH scale

  pH below 7 = acidic pH 7 = neutral pH above 7 = basic

  0 1 2 3 4 5 6 **7** 8 9 10 11 12 13 14

  Acids *Neutral* *Bases*
  - Each decrease of 1 on the pH scale indicates 10X more acidic
    - For example, pH 4 is ten times more acidic than pH 5
    - pH 3 is 1000X more acidic than pH6

pH Indicators

- The pH of acids and bases cannot be determined by sight.
  - Instead, pH is measured by other chemicals called **indicators**,
  - or by a **pH meter** that measures the electrical conductivity of the solution using electrical probes to measure how solutions conduct electricity.
- **pH indicators** change colour based on the solution they are placed in.
  - **Litmus paper** is the most common indictor.
    - Two colours of litmus paper: **Blue = basic** (>7) and **Red = acidic** (<7).

Acids

- If you know a compound's chemical formula, you may be able to identify it as an acid.
  - Acids often behave like acids only when dissolved in water.
  - Therefore, acids are often written with subscript (aq) = aqueous = water
- The chemical formula of an acid usually starts with Hydrogen (H).
  - Acids with a carbon usually have the C written first.
    - $HCl_{(aq)}$ = hydrochloric acid, $HNO_{3(aq)}$ = nitric acid, $CH_3COOH_{(aq)}$ = acetic acid

Naming Acids

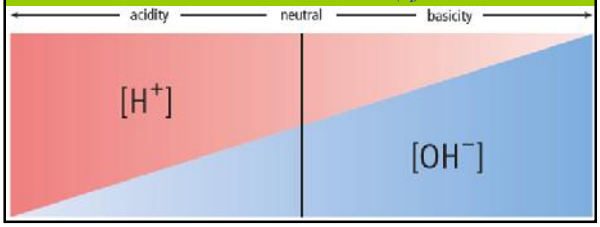
- Hydrogen + …-*ide* = Hydro…*ic* acid
  - $HF_{(aq)}$ = hydrogen fluoride = hydrofluoric acid
- Hydrogen + …-*ate* = …*ic* acid
  - $H_2CO_{3(aq)}$ = hydrogen carbonate = carbonic acid
- Hydrogen + …-*ite* = …*ous* acid
  - $H_2SO_{3(aq)}$ = hydrogen sulphite = sulphurous acid

Bases

- If you know a compound's **chemical formula**, you may be able to identify it as a **base**.
  - Bases, like acids, often behave like bases only when dissolved in water
  - Therefore, bases are often written with subscript **(aq) = aqueous = water**
- The chemical formula of a base usually ends with **hydroxide (-OH).**
- Examples of **common bases:** $NaOH_{(aq)}$, $Mg(OH)_{2(aq)}$, $Ca(OH)_{2(aq)}$, $NH_4OH_{(aq)}$

Production of Ions

- Acids and bases can conduct electricity because they release **ions** in solution.
  - Acids release **hydrogen ions, $H^+_{(aq)}$**
  - Bases release **hydroxide ions $OH^-_{(aq)}$**



- The pH of a solution refers to the **concentration** of ions it has.
  - Square brackets are used to signify concentration, **$[H^+_{(aq)}]$, $[OH^-_{(aq)}]$**
    - High $[H^+_{(aq)}]$ = low pH, very acidic
    - High $[OH^-_{(aq)}]$ = high pH, very basic
  - A solution cannot have BOTH high $[H^+_{(aq)}]$ and $[OH^-_{(aq)}]$; they cancel each other out and form **water**. This process is called **neutralization**.
  - **$H^+_{(aq)} + OH^-_{(aq)}$ ì $H_2O_{(}$**