Vocabulary: Titration

Vocabulary

- Acid – a water-soluble compound that is capable of donating protons (H^+ ions) to another substance.
  - Acids often are sour in taste, can burn the skin and eyes, and react with a *base* to produce a salt and water.
  - The chemical formulas of acids usually begin with H. Examples are HCl (hydrochloric acid), H_2SO_4 (sulfuric acid), and HNO_3 (nitric acid).
  - There are several commonly-used definitions of acids and bases. The definition used here is the Brønsted-Lowry definition.
- Analyte – a substance that is being investigated.
  - In a *titration*, the analyte is a substance of unknown composition or concentration that is placed in a flask.
- Base – a water-soluble chemical compound that is able to accept protons (H^+ ions).
  - Bases often are bitter in taste, have a slippery texture, and react with acids to produce a salt and water.
  - The chemical formulas of bases usually end with OH. Examples are NaOH (sodium hydroxide), KOH (potassium hydroxide), and $Ca(OH)_2$ (calcium hydroxide).
- Dissociate – to break up into smaller components.
  - For example, when hydrochloric acid (HCl) is dissolved in water it dissociates into H^+ and Cl^- ions.
  - When sodium hydroxide (NaOH) dissolves in water it dissociates into Na^+ and OH^- ions.
  - Different acids and bases have different levels of dissociation when added to water.
- Equivalence point – the point in a titration when there are equivalent amounts of *titrant* and analyte so the two substances can react completely with nothing left over.
  - If 1 mole of titrant reacts with 1 mole of analyte, the equivalence point is reached when the moles of titrant and analyte are equal.
  - If 2 moles of titrant react with 1 mole of analyte, the equivalence point is reached when there are exactly twice as many moles of titrant as analyte.
- Indicator – a substance that changes color when in contact with an acid or base.
  - Examples of indicators include litmus, bromthymol blue, methyl orange, and phenolphthalein.
  - Different indicators change color at different *pH* values.

- Litmus paper – a paper coated with an indicator called litmus, which is derived from a species of lichen.
    - Litmus paper is produced as red and blue strips. In an acid, both strips turn red. In a base, both strips turn blue. In a neutral solution, the red strip remains red and the blue strip remains blue.

- Molarity – a measure of concentration equal to moles per liter.
    - The symbol for molarity is M.
    - Brackets are also used to signify molarity. For example, the statement "[HCl] = 0.1 M" indicates that 0.1 moles of HCl are dissolved in one liter of water.

- Neutralize – to make an acidic or basic solution chemically neutral.
    - Acids can be neutralized through chemical reaction with bases, and vice versa. Most acid/base reactions produce a salt and water.
        - For example, the reaction of hydrochloric acid and sodium hydroxide produces water and sodium chloride (table salt):

$$HCl + NaOH \rightarrow NaCl + H_2O$$

- pH – a measure of the concentration of hydrogen ions [H^+] in a solution.
    - The symbol "pH" stands for "potential of hydrogen" or "power of hydrogen."
    - As [H^+] increases, the solution becomes more acidic.
    - The pH of a solution is equal to the negative base-10 logarithm of the concentration of hydrogen ions: $pH = -\log[H^+]$.

- Strong acid – an acid that has a relatively high degree of dissociation in water.

- Strong base – a base that has a relatively high degree of dissociation in water.

- Titrant – a substance of known composition and concentration that is used to react with an analyte.
    - In a titration, the titrant is the substance that is placed in the burette and added to the analyte in the flask.

- Titration – a process in which a chemical reaction is used to measure the concentration or to determine the identity of a solution.

- Titration curve – a graph of a titration in which the amount of titrant is recorded on the *x*-axis and the pH of the analyte is recorded on the *y*-axis.

- Weak acid – an acid that has a relatively low degree of dissociation in water.
    - If a weak acid is neutralized by a strong base, the resulting solution is basic.

- Weak base – a base that has a relatively low degree of dissociation in water.
    - If a weak base is neutralized by a strong acid, the resulting solution is acidic.