8.2 pH of a Solution

Definitions

- Neutralization
- pH

Auto-ionization of Water

- 2 out of every billion water molecules will auto ionize
  - $H_2O_{(l)} \rightarrow H^+_{(aq)} + OH^-_{(aq)}$
  - This gives pure water a pH of 7 (neutral)
  - $[H^+_{(aq)}] = 1 \times 10^{-7}$ mol/L
  - $[OH^-_{(aq)}] = 1 \times 10^{-7}$ mol/L

Hydrogen Ion Concentration and pH

- $pH = -\log[H^+_{(aq)}]$ or $[H^+_{(aq)}] = 10^{-pH}$

- a logarithmic scale a pH of 2 is 10 times more acidic than a pH of 3.
- E.g. pH of a solution with a hydrogen ion conc. of 4.7×10^{-11} mol/L
  $pH = -\log[H^+_{(aq)}] = -\log[4.7 \times 10^{-11}] = 10.33$

- $[H^+_{(aq)}] = [OH^-_{(aq)}]$ therefore the solution is neutral
- $[H^+_{(aq)}] > [OH^-_{(aq)}]$ the solution is acidic
- $[H^+_{(aq)}] < [OH^-_{(aq)}]$ the solution is basic

- pH = 7 is neutral
- pH > 7 is basic
- pH < 7 is acidic

Neutralization

- $H^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(l)}$ (net ionic equation)

Measuring pH

- We will use acid base indicators such as litmus and pH meters.
- Litmus: pH<4.7 = red, pH>8.3 = blue, 4.7>pH<8.3 = brown.

Homework

- Practice Q's: 1-10
- Section Q's: 1-6