Chapter 13 – Acid-Base Reactions

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- Bronsted-Løwry acid – donates H^+, base takes H^+
- Arrhenius – Acids take OH^-, bases gives off OH^-
- $H_3PO_4 + C_2H_3O_2 \longleftrightarrow H_2PO_4{}^- + HC_2H_3O_2{}^+$ conjugate acid/base example
    1. $H_2PO_4{}^-$ is the conjugate base pair of H_3PO_4, while $HC_2H_3O_2{}^+$ is the conjugate acid pair of $C_2H_3O_2$
    2. Conjugate acid/base pairs differ by one H^+ (nothing else)
- Ion Product (k_w)
    1. For water, $k_w = [H^+][OH^-] = 1 \cdot 10^{-14}$
- Acid-Base Determination
    1. $[H^+] > [OH^-]$ acidic
    2. $[H^+] < [OH^-]$ basic
    3. $[H^+] = [OH^-]$ neutral
- pH formulas
    1. pH$=-\log\left[H^+\right]$
    2. pOH$=-\log\left[OH^-\right]$
    3. pH + pOH = 14
    4. acidic $0 \leftrightarrow 7 \leftrightarrow 14$ basic
- Logarithms without a calculator:
    1. $-\log\left(m \cdot 10^{-n}\right) = n - 0.m$
    2. ex. $-\log\left(3 \cdot 10^{-5}\right) = 5 - 0.3 = 4.7$

- Strong Acid − Completely dissociates (HCl, H_2SO_4, HNO_3, $HClO_4$, HBr, and HI)
- Strong Base − Completely dissociates, hydroxides of columns I and II
- Weak Acids and Bases − Set up equilibriums
- $k_w = k_a \cdot k_b$ ($k_w = 1 \cdot 10^{-14}$)
- pk_a=$-\log_{10}(k_a)$, higher k_a means stronger acid
- Percent Ionization = $\frac{[H^+]}{[H_{acid}]} \cdot 100\%$ tells how much acid has broken up
- Polyprotic acids − Give up more than one $[H^+]$ (ex. $H_2C_2O_4$)
- Stronger Acid, $[H^+] \uparrow$, pH $\downarrow$, $k_a \downarrow$, p$k_a \uparrow$
- k_w is different at different temperatures

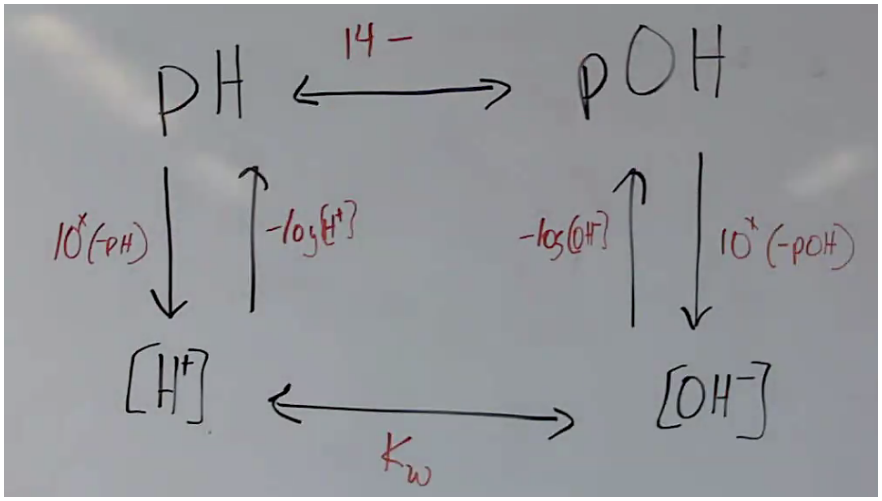

Figure 1: pH Flow Chart