Acid-Base Chemistry Review

- Acid-Base Concepts
- Water Equilibrium
- Calculating K_a, K_b ($K_aK_b = K_w$)
- Predicting Acid-Base Equilibria

Calculate the pH of a 0.350 mol/L solution of calcium hydroxide.

$$Ca(OH)_{2(aq)} \longrightarrow Ca^{2+}_{(aq)} + 2OH^-_{(aq)}$$

0.350 mol/L 0.700 mol/L

$pOH = -\log[OH^-]$ $pH + pOH = 14.00$

Calculate the pH of a 0.450 mol/L solution of acetic acid.

$$CH_3COOH_{(aq)} + H_2O_{(l)} \rightleftharpoons CH_3COO^-_{(aq)} + H_3O^+_{(aq)}$$

$0.450\ mol/L$

$$K_a = \frac{[CH_3COO^-_{(aq)}][H_3O^+_{(aq)}]}{[CH_3COOH_{(aq)}]}$$

$$K_a = \frac{[H_3O^+_{(aq)}]^2}{[CH_3COOH_{(aq)}]}$$

$$[H_3O^+_{(aq)}] = \sqrt{K_a [CH_3COOH_{(aq)}]}$$

Calculate the pH of a 0.450 mol/L solution of HCl.

$$HCl_{(aq)} \longrightarrow H^+_{(aq)} + Cl^-_{(aq)}$$

0.450 mol/L 0.450 mol/L

$$pH = -\log[H_3O^+_{(aq)}]$$

Use the five-step method to predict the following acid-base equilibria:

- Ammonium nitrate is added to a nitric acid solution.

- Methanoic acid is added to a sodium hydrogen carbonate solution.

Calculate the pH and hydronium ion concentration if a 0.227 mol/L solution of carbonate ions is added to water.

$$CO_{3(aq)}^{2-} + H_2O_{(l)} \rightleftharpoons HCO_{3(aq)}^{-} + OH_{(aq)}^{-}$$

$0.27\ mol/L$

$$K_b = \frac{[HCO_{3(aq)}^{-}][OH_{(aq)}^{-}]}{[CO_{3(aq)}^{2-}]}$$

$$K_a K_b = K_w$$

$$K_b = \frac{K_w}{K_a}$$

$$K_b = \frac{[OH_{(aq)}^{-}]^2}{[CO_{3(aq)}^{2-}]}$$

$$[OH_{(aq)}^{-}] = \sqrt{K_b [CO_{3(aq)}^{2-}]}$$