STUDY SHEET

CHEMISTRY 106 FUNDAMENTAL CHEMISTRY

ACID - BASE pH CALCULATIONS

pH of a strong acid solution $[HA] = [H_3O^+]$ $pH = -\log [H_3O^+]$

pH of a strong base solution $[B] = [OH^-]$ $pH = 14 + \log [OH^-]$

pH of a weak acid solution $K_a = \frac{[H_3O^+][A^-]}{[HA]}$ $x = \frac{-(10^{-7}+K_a) + \sqrt{(10^{-7}+K_a)^2 + (4)(M_i)(K_a)}}{2}$

$[H_3O^+] = 10^{-7} + x$ $pH = -\log [H_3O^+]$

pH of a weak base solution $K_b = \frac{[BH^+][OH^-]}{[B]}$ $x = \frac{-(10^{-7}+K_b) + \sqrt{(10^{-7}+K_b)^2 + (4)(M_i)(K_b)}}{2}$

$[OH^-] = 10^{-7} + x$ $pH = 14 + \log [OH^-]$

pH of a mixed (buffer) solution $[H_3O^+] = \left(\frac{[HA]}{[A^-]}\right) K_a$ $pH = -\log [H_3O^+]$

TITRATIONS

moles analyte $= (M_{analyte})(V_{analyte})$ mL titrant to end point $= \frac{(M_{analyte})}{(M_{titrant})}(\text{mL analyte})$

	STRONG-STRONG	WEAK ACID-STRONG BASE	WEAK BASE-STRONG ACID
START POINT	$[HA] = [H_3O^+]$ $pH = -\log [H_3O^+]$ $[B] = [OH^-]$ $pH = 14 + \log [OH^-]$	$x = \frac{-(10^{-7}+K_a) + \sqrt{(10^{-7}+K_a)^2 + (4)(M_i)(K_a)}}{2}$ $M_i = M_{analyte}$	$x = \frac{-(10^{-7}+K_b) + \sqrt{(10^{-7}+K_b)^2 + (4)(M_i)(K_b)}}{2}$ $M_i = M_{analyte}$
HALFWAY POINT	$[H_3O^+] = \frac{1/2 \text{ moles analyte}}{\text{total volume}}$	$pH = pK_a$	$pH = pK_a$
END POINT	$pH = 7$	$x = \frac{-(10^{-7}+K_b) + \sqrt{(10^{-7}+K_b)^2 + (4)(M_i)(K_b)}}{2}$ $M_i = M_{analyte}\frac{(\text{mL analyte})}{(\text{total volume})}$	$x = \frac{-(10^{-7}+K_a) + \sqrt{(10^{-7}+K_a)^2 + (4)(M_i)(K_a)}}{2}$ $M_i = M_{analyte}\frac{(\text{mL analyte})}{(\text{total volume})}$