Unit 3 Formulae

1) Equilibrium Law Expression:

$$aA + bB \leftrightarrows cC + dD$$

$$K = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

A, B, C, and D are chemical entities in gas or aqueous phases
a, b, c, and *d* are the coefficients in the balanced chemical equation
K is the equilibrium constant

2) Solubility Product Constant

$$cAB\ (s) \leftrightarrows aA^+\ (aq) + bB^-\ (aq)$$

$$K_{sp} = [A^+]^a[B^-]^b$$

A^+ and B^- are ions formed in aqueous phases
a, and b are the coefficients in the balanced ionic equation
K_{sp} is the solubility product constant

3) Ion product constant for water

$K_w = [H^+][OH^-]$ *at equilibrium $K_w = 1.0 \times 10^{-14}$; $[H^+]=[OH^-]= 1.0 \times 10^{-7}$ mol/L

4) $pH = -\log[H^+]$ $pOH = -\log[OH^-]$
$[H^+] = 10^{-pH}$ $[OH^-] = 10^{-pOH}$
$pH + pOH = 14.00$

5) $pK_w = -\log K_w$ $pH + pOH = pK_w$

6) $[H^+] = p/100 \times [HA]$ p is percent ionization; [HA] is concentration of acid

7) $K_a = \frac{[H^+][A^-]}{[HA]}$ $K_b = \frac{[B^+][OH^-]}{[BOH]}$

8) $K_aK_b = K_w$ **or** $K_b = K_w/K_a$ **or** $K_a = K_w/K_b$

9) $c_Av_An_A = c_bv_bn_b$
c_A = [acid]; c_b = [base] v_A = volume of acid; v_b = volume of base
n_A = moles of acid (subscript beside H in formula); n_b = moles of base (subscript beside OH in formula)