CH302 Equations and Constants that might be found on Exam 1

1 atm = 1.013×10^5 Pa = 760 torr
Water spec. heat = 4.18 J/g °C
R = 0.082 l atm/K mol

R= 1.987 cal/mol K
R = 8.314 J/mol K
N = 6.022×10^{23}

Physical Equilibria

$k = PV$
$V = kT$
$V = kn$
$P_1V_1 = P_2V_2$
$V_1/T_2 = V_2/T_1$
$P_1V_1/T_2 = P_2V_2/T_1$
$V_1/n_2 = V_2/n_1$
$PV = nRT$
$n = g/MW$
$\rho = g/ml$
$KE = 0.5\ mv^2$
$v = (3RT/MW)^{0.5}$
$(P - n^2a/V^2)(V-nb) = nRT$

Relative rate $= (MW_1/MW_2)^{0.5}$
$F \alpha q^+ q^- / d^2$
$\Delta H_{soln} = \Delta H_{solv} - \Delta H_{lattice}$
$m = n_{solute}/kg_{solvent}$
$M = n_{solute}/V$
$P_{gas} = kC_{gas}$
$P_{solv} = X_{solv}\ P^0_{solv}$
$\Delta T = iK_bm$
$\Delta T = -iK_fm$
$\Pi = iMRT$
$\ln(P_2/P_1) = \Delta H/R(1/T_1-1/T_2)$
$P_{tot} = P_1 + P_2$

Thermodynamics equations

$\Delta H = mC\Delta T$
$\Delta H_{rxn}° = \Sigma\ n\ \Delta H_f°_{products} - \Sigma\ n\ \Delta H_f°_{reactants}$
$\Delta H_{rxn}° = \Sigma$ B.E. $_{reactants} - \Sigma$ B.E. $_{products}$
$H = E + PV$
$\Delta E = = q + w$
$\Delta E = q - P\Delta V$
$w = - P\Delta V$
$P\Delta V = \Delta nRT$

$\Delta H = \Delta E + \Delta nRT$
$\Delta S_{rxn}° = \Sigma\ n\ \Delta S_f°_{products} - \Sigma\ n\ \Delta S_f°_{reactants}$
$\Delta G = \Delta H - T\Delta S$ (constant T, P)
$\Delta S_{univ} = \Delta S_{surr} - \Delta S_{sys}$ (constant T, P)
$\Delta S_{surr} = -\Delta H_{sys}/T$
$\Delta S = q/T$
$\Delta G_{rxn}° = \Sigma\ n\ \Delta G_f°_{products} - \Sigma\ n\ \Delta G_f°_{reactants}$

Equilibrium

$\ln(K_2/K_1) = \Delta H/R(1/T_1-1/T_2)$
$Q = [C]^c[D]^d / [A]^a[B]^b$
$K_c = [C]^c[D]^d / [A]^a[B]^b$
$K_p = P_C{}^c\ P_D{}^d / P_A{}^a\ P_b{}^b$
$K_p = K_c(RT)^{\Delta n}$
$\Delta G^o = -RT \ln K$
$K_w = K_aK_b$
$K_w = [H_30^+][OH^-] = 1.0 \times 10^{-14}$

$pH + pOH = 14$
$pH = -\log[H_3O^+]$
$pOH = -\log[OH^-]$
$pK_a = -\log K_a$
$[H^+] = (K_a\ C_{HA})^{0.5}$
$[OH^-] = (K_b\ C_B)^{0.5}$
$[H^+] = K_a\ C_{HA}/C_{A-}$
$[OH^-] = K_b\ C_{A-}/C_{HA}$