Equations for Exam 3

R = 0.0821 L atm/(mol K) = 8.314 J/(mol K) = 8.314×10^{-3} kJ/(mol K)
1 atmosphere = 760 mm Hg

$pH = -\log\left[H_3O^+\right]$ $\qquad$ $pOH = -\log\left[OH^-\right]$

K_a is the equilibrium constant for the reaction $HA_{(aq)} + H_2O_{(l)} \rightleftharpoons A^-_{(aq)} + H_3O^+_{(aq)}$

K_b is the equilibrium constant for the reaction $B^-_{(aq)} + H_2O_{(l)} \rightleftharpoons HB_{(aq)} + OH^-_{(aq)}$

$pK_a = -\log(K_a)$ $\qquad$ $pK_b = -\log(K_b)$

$K_aK_b = K_w = [H_3O^+][OH^-] = 10^{-14}$ $\qquad$ $pH + pOH = 14$ $\qquad$ $pK_a + pK_b = 14$

$$pH = pK_a + \log\frac{[\text{conjugate base}]}{[\text{acid}]}$$

$S_g = k_H P_g$ $\qquad$ $P_{solvent} = X_{solvent} P^0_{solvent}$

$\Delta T_{bp} = K_{bp} m_{solute} i$ $\qquad$ $\Delta T_{fp} = K_{fp} m_{solute} i$

For water, K_{fp} = -1.86 °C/m and K_{bp} = 0.512 °C/m