

## Equations and Conversions

Pressure conversions: 1 atm = 1.01325 x 10<sup>5</sup> Pa = 760 mm Hg = 760 torr

Ideal Gas Constant: R = 8.314 J K<sup>-1</sup> mol<sup>-1</sup> = 0.08206 L atm mol<sup>-1</sup> K<sup>-1</sup>

Gas Laws:  $PV = nRT$   $P + \frac{an^2}{V^2} (V - nb) = nRT$

$\Delta E = q + w$   $q = nC\Delta T$   $q = n\Delta H_{fus/vap}$

$w = Fd = -P_{ext}\Delta V$

$\Delta H = \Delta E + P\Delta V$   $\Delta H^\circ = \Delta H_f^\circ(pdt) - \Delta H_f^\circ(rct)$

$\Delta S = \frac{q_{rev}}{T}$   $\Delta S^\circ = S^\circ(pdt) - S^\circ(rct)$   $aA + bB \rightleftharpoons cC + dD$

$\Delta G = \Delta H - T\Delta S$   $\Delta G = \Delta G^\circ + RT \ln Q$  ;  $Q = \frac{[C]^c [D]^d}{[A]^a [B]^b} = \frac{P_C^c P_D^d}{P_A^a P_B^b}$

$\Delta G = \Delta RT \ln K_{eq}$

$\Delta G = \Delta nFE_{cell}$   $E_{cell} = E_{cell}^\circ - \frac{RT}{nF} \ln Q = E_{cell}^\circ - \frac{0.0592V}{n} \log Q$   $F = 96,450 \text{ C mol}^{-1}$

Rate =  $-\frac{1}{a} \frac{d[A]}{dt} = -\frac{1}{b} \frac{d[B]}{dt} = \frac{1}{c} \frac{d[C]}{dt} = \frac{1}{d} \frac{d[D]}{dt}$   $aA + bB \rightleftharpoons cC + dD$

Rate =  $k[A]^m[B]^n$

Arrhenius equation:  $k = A \exp\left(-\frac{E_a}{RT}\right)$

$[A] = -kt + [A]_0$   $t_{1/2} = \frac{[A]_0}{2k}$

Integrated Rate Laws:  $\ln[A] = -kt + \ln[A]_0$   $t_{1/2} = \frac{\ln 2}{k}$

$\frac{1}{[A]} = kt + \frac{1}{[A]_0}$   $t_{1/2} = \frac{1}{[A]_0 k}$

$pH = -\log[H_3O^+]$   $pK = -\log K$

$pH = pK_a + \log\left(\frac{[A^-]}{[HA]}\right)$

$K_w = K_a K_b$   $K_w = 10^{-14}$

$ax^2 + bx + c = 0$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$