Constants, Conversion Factors and Equations (Exam IV)

Constants and Conversion Factors:

$h = 6.626 \times 10^{-34}$ J·s

$c = 2.9979 \times 10^{8}\ \frac{\text{m}}{\text{s}}$

1 J = 1 $\frac{\text{kg}*\text{m}^2}{\text{s}^2}$

$N_A = 6.022 \times 10^{23}$

$R = 0.08206\ \frac{L \cdot atm}{mol \cdot K} = 8.31451\ \frac{J}{mol \cdot K}$

1 cal = 4.184 J = 1 × 10^{-3} Cal

1 atm = 760 Torr = 101.3 kPa = 1.013 bar

Equations:

$d = \frac{m}{\text{V}}$

$\nu = \frac{c}{\lambda}$

$E_{\text{photon}} = h\nu$

E_K (ejected electron) = $E_{\text{photon}} - \phi$

$E_K = \frac{1}{2} m\text{v}^2$

$\Delta E = -2.18 \times 10^{-18}\text{J}\left(\frac{1}{\text{n}_\text{f}^2} - \frac{1}{\text{n}_\text{i}^2}\right)$

$E_{\text{photon}} = |\Delta E|$

$\lambda_{\text{matter}} = \frac{h}{m\text{v}}$

$\text{M}_\text{i}\text{V}_\text{i} = \text{M}_\text{f}\text{V}_\text{f}$

PV = nRT

PM = dRT

$P_A = \chi_A P_{total}$

$\chi_A = \frac{n_A}{n_{total}}$

$E_K = \frac{1}{2} mv^2$

$\overline{E_K} = \frac{3}{2} RT$

$v_{rms} = \sqrt{\frac{3\,RT}{M}}$

$q = mC_s\Delta T$

$q_{rxn} = -q_{soln}$

$\Delta H = q_P$

$\Delta G = \Delta H - T\Delta S$

$\Delta S°_{rxn} = \Sigma[nS°_m \text{ (products)}] - \Sigma[nS°_m \text{ (reactants)}]$ (similar for $\Delta G°$, $\Delta H°$)

$\Delta G = \Delta G° + RT(\ln Q)$

$\Delta G° = -RT(\ln K)$

$k = Ae^{\frac{-E_a}{RT}}$

First order: $\ln[A]_t = -kt + \ln[A]_0$

$t_{1/2} = \frac{0.693}{k}$

Second order: $\frac{1}{[A]_t} = kt + \frac{1}{[A]_0}$

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

$pH + pOH = pK_w$ ($pK_w = 14.00$ at 25 °C)

$K_a \times K_b = K_w$