CH131 Exam equation sheet

$$E = -(2.1799\ aJ)Z^2 \left\{\frac{1}{n_1^2} - \frac{1}{n_2^2}\right\} \qquad n_1 = 1,2,\ldots,\ \ n_2 = n_1 + 1,\ n_1 + 2, \ldots$$

$E = (2.1799\ aJ)Z^2 \left\{\frac{1}{n_f^2} - \frac{1}{n_i^2}\right\}$ $\quad$ *where* $n(initial) > n(final)$ $\quad$ *emission* $\quad$ ($E_i > E_f$)

$E = (2.1799\ aJ)Z^2 \left\{\frac{1}{n_i^2} - \frac{1}{n_f^2}\right\}$ $\quad$ *where* $n(final) > n(initial)$ $\quad$ *absorption* ($E_f > E_i$)

$c = \lambda\nu \quad E = nh\nu \quad E = \frac{hc}{\lambda} \quad \lambda = \frac{h}{p} \quad p = mv \quad F = ma \quad x = [-b \pm (b^2 - 4ac)^{1/2}]/(2a)$

$\Delta x \Delta p \geq \frac{h}{4\pi} \quad KE = \frac{1}{2}mv^2 \qquad$ Kinetic Energy = $h\nu - h\nu_o$ (when $\nu > \nu_o$)

$$R = 8.31451\ \frac{J}{K \cdot mol} = 0.0820574 \frac{L \cdot atm}{K \cdot mol} = 62.3637\ \frac{L \cdot Torr}{K \cdot mol} = 8.31447 \times 10^{-2}\ \frac{L \cdot bar}{K \cdot mol}$$

amu = m_u = Dalton(Da) $\quad h = 6.6261 \times 10^{-34} Js \quad 1\ eV = 1.602 \times 10^{-19} J$

T (in K) = 273.15 + °C $\qquad c = 2.9979 \times 10^8 \frac{m}{s}$

$$1\ atm = 1.01325 \times 10^5\ Pa = 1.01325\ bar = 760\ Torr = 760\ mmHg \quad 1V = J/C$$

$$m_e = 9.109 \times 10^{-31} kg \quad m_n = 1.67493 \times 10^{-27} kg \quad m_p = 1.67262 \times 10^{-27} kg$$

$$F = N_A e = 9.64853 \times 10^4 \frac{C}{mol} \quad e = 1.60218 \times 10^{-19}\ C$$

$V_{sphere} = \frac{4}{3}\pi r^3 \quad v(rms) = \sqrt{\frac{3RT}{M}} \quad N_A = \frac{6.02214 \times 10^{23}}{mol}$ $\quad$ 1 cm^3 = 1 mL $\quad$ M = n/V

$P = \frac{F}{A} \quad V = \frac{c}{P} \quad V = mT \quad \text{density} = \frac{MP}{RT} \quad (P_iV_i/T_i) = (P_fV_f/T_f) \quad \chi_i = n_i/n_{total}$

$$PV = nRT \quad \left(P + a\frac{n^2}{V^2}\right)(V - bn) = nRT \quad \Delta U = q + w \quad w = -P_{ex}\Delta V \quad w = -nRT \ln\frac{V_f}{V_i}$$

$$P_i = X_i P_{tot} \quad L * atm = 101.325\,J \quad L * bar = 100\,J \quad E(k) = \frac{3}{2}RT = \frac{1}{2}M(kg)v2$$

$$q_{cal} = C_{cal} \cdot \Delta T; \quad q_{sys} = n \cdot \Delta H; \quad P \cdot \Delta V = \Delta n \cdot R \cdot T; \quad \Delta H = \Delta U + P\Delta V$$

$$\frac{Rate(A)}{Rate(B)} = \frac{time(B)}{time(A)} = \left(\frac{M(B)}{M(A)}\right) \quad Graham's law\ of\ effusion$$

$$\Delta U = C_v \Delta T \quad \Delta H = C_p \Delta T \quad C_p = C_v + R \quad \Delta H^\circ_{rxn}(T_2) = \Delta H^\circ_{rxn}(T_1) + \Delta C^\circ_{p,rxn}\Delta T$$

$\Delta H^o_{rxn} = \Delta H^o_{prod} - \Delta H^o_{react} \quad c_p = q_p/\Delta T \quad C_p = q_p/(n\Delta T) \quad q = mC_s\Delta T$