General Chemistry I Equation Sheet

Think about how to set up the problem first, then apply the needed principles and formulas.

Waves and Energy

$E_k = \frac{1}{2}mu^2$

$E_{el} \propto \frac{Q_1 Q_2}{d}$

$c = \lambda\nu$

$E = h\nu$

Rydberg Equation: (ALEKS only)

$\frac{1}{\lambda} = R_\infty(\frac{1}{n_f^2} - \frac{1}{n_i^2})$

$\frac{1}{\lambda} = \frac{R_H}{hc}(\frac{1}{n_f^2} - \frac{1}{n_i^2})$

Bohr Equation:

$\Delta E = h\nu = -b(\frac{1}{n_f^2} - \frac{1}{n_i^2})$

$E_n = -b(\frac{1}{n^2})$

De Broglie's wavelength:

$\lambda = \frac{h}{m \cdot u}$

Thermodynamics

$\Delta U = q + w$

$w = -P\Delta V$

$\Delta U = q - P\Delta V$

$\Delta H = \Delta U + P\Delta V$

$q_{sys} = -sm\Delta T$

$q_{surr} = sm\Delta T$

$q = C\Delta T$

$q_{rxn} = -C_{cal}\Delta T$

$\Delta H^\circ_{rxn} = \Sigma\Delta H^\circ_{f \text{ products}} - \Sigma\Delta H^\circ_{f \text{ reactants}}$

$\Delta H^\circ = \Sigma B.E._{\text{ bonds broken}} - \Sigma B.E._{\text{ bonds formed}}$

pH

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

$[H_3O^+] = 10^{-pH}$

$pOH = -\log[OH^-]$

$[OH^-] = 10^{-pOH}$

Gases

$u_{rms} = \sqrt{\frac{3RT}{mw}}$

$\frac{u_{rms}(1)}{u_{rms}(2)} = \sqrt{\frac{mw_2}{mw_1}}$

$\chi_i = \frac{n_i}{n_{total}}$

Ideal Gas Law:

$PV = nRT$

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

Boyle's Law:

$P_1V_1 = P_2V_2$

Charles' Law:

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

Combined Gas Law:

$\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

Clausius - Clapeyron Equation:

$\ln(\frac{P_1}{P_2}) = \frac{\Delta H_{vap}}{R}(\frac{1}{T_2} - \frac{1}{T_1})$

$\ln(P) = -\frac{\Delta H_{vap}}{RT} + C$

Periodic Table

Formal Charge $= e^-_{\text{valence}} - e^-_{\text{associated}}$

% by mass of element $= \frac{n \times m_{\text{element}}}{mw_{\text{molecule}}} \times 100\%$

Bond Order $= \frac{\#\text{ of bonds around atom}}{\#\text{ of bond groups around atom}}$

$Z_{eff} = Z - \sigma$

$F \propto \frac{Q_1 Q_2}{d^2}$

Constants

$R_H = \text{Rydberg Constant} = 2.18 \times 10^{-18}\ J$

$R_\infty = 1.1 \times 10^7\ m^{-1}$

$R = 0.08206\ \frac{L \cdot atm}{mol \cdot K} = 8.314\ \frac{J}{mol \cdot K}$

$h = 6.626 \times 10^{-34}\ J \cdot s$

$c = 2.998 \times 10^8\ \frac{m}{s}$

$b = 2.180 \times 10^{-18}\ J$

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Burdge, J., & Overby, J. (2018). *Chemistry: Atoms First.* McGraw-Hill Education.