CHE 102 Midterm Cheat Sheet

SI Prefixes and Conversion

| Factor | Prefix | Symbol | |:–|:–|:–| | 10^3 | kilo | k | | 10^-6 | micro | μ |

Temperature Conversion Factors

1K = 1.8°R 1K = 1.8°F 1°C = 1.8°F 1°C = 1.8°R 1°C = 1K 1°F = 1°R

Density

$\rho = \frac{m}{v}$

Average Atomic Mass

$M = \sum x_i M_i$

Mole Fraction and Percentage

$x_A = \frac{n_A}{n_T} = \frac{n_A}{\sum_i n_i}$ % = $x_A \times 100\%$

Mass Fraction and Percentage

$w_A = \frac{m_A}{m_T} = \frac{m_A}{\sum_i m_i}$ % = $w_A \times 100\%$

Average Molar Mass

$M = \sum x_i M_i$

Concentration

molarity = amount of solute (mol) / volume of solution (L) mass percent = weight of solute / weight of solution volume percent = volume of solute / volume of solution weight-to-volume = weight of solute / volume of solution molality = amount of solute (mol) / amount of solvent (kg) ppm = g solute / 10^6 g solution ppb = g solute / 10^9 g solution

Percentage Yield and Excess

$\%\text{ yield} = \left(\frac{\text{actual}}{\text{theoretical}}\right) \times 100\%$ $\%\text{ excess} = \frac{\text{amount provided} - \text{amount required}}{\text{amount required}} \times 100\%$

Boyle's Law (Constant n, T)

$P \propto \frac{1}{v}$ $P_1 V_1 = P_2 V_2$

Charles' Law (Constant n, P)

$V \propto T$ $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ Temperature in K

Avogadro's Law (Constant T, P)

$V \propto n$ $\frac{V_1}{n_1} = \frac{V_2}{n_2}$ At 0°C and 1 atm: 1 mol gas = 22.414 L

Ideal Gas Law

$PV = nRT$ or $PV_m = RT$, where $V_m = \frac{V}{n}$ Temperature in K

Ideal Gas Assumptions:
- No intermolecular forces between molecules
- Gas molecules have no volume

Approximation valid at high T, low P

Gas Density

$\rho = \frac{PM}{RT}$

Dalton's Law

$P = P_A + P_B \; y_A = \frac{n_A}{n} = \frac{P_A}{P}$ or $y_A = \frac{n_A}{n} = \frac{V_A}{V}$

Measuring Pressure with an Open-End Manometer

$\Delta P_{\{\mathrm{mmHg}\}} = \Delta h_{\{\mathrm{Hg}\}}$