

### Universal Constants

**Avogadro's (Loschmidt's)**

**Number**

$$L = 6.022 \cdot 10^{23} \text{ particles /mole}$$

**Boltzmann's Constant**

$$k_B = 1.381 \cdot 10^{-23} \text{ J/K}$$

**Gas Constant**

$$R = L \cdot k_B = 8.315 \text{ J/(K mol)}$$

**Planck's Constant**

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

**Molar Volume (NSTP)**

$$V_m = 24.79 \text{ dm}^3 \text{ mol}^{-1} \text{ (25}^\circ\text{C, 1 bar)}$$

**Electron Mass**

$$m_e = 9.109 \cdot 10^{-31} \text{ kg}$$

**Proton Mass**

$$m_p = 1.673 \cdot 10^{-27} \text{ kg}$$

**Permittivity of Vacuum**

$$\epsilon_0 = 8.854 \cdot 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$$

$$1/(4\pi\epsilon_0) = 0.8988 \cdot 10^{10} \text{ C}^{-2} \text{ N}^{-1} \text{ m}^2$$

**Gravitational Acceleration**

$$g = 9.807 \text{ m s}^{-2}$$