

# Formulas

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

$$A = A_0 \frac{1}{2}^{(t/t_{half})}$$

$$c = \lambda \nu$$

$$E = h\nu$$

$$M = \frac{n}{V}$$

$$m = \frac{n}{\text{kg solvent}}$$

$$M_1 V_1 = M_2 V_2$$

$$pX = -\log[X]$$

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

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$$P_1 V_1 = P_2 V_2$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$PV = nRT$$

$$\Delta T_f = K_f m$$

$$\Delta T_b = K_b m$$

$$q = m C_p \Delta T$$

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

$$\Delta G_{rxn} = \Delta G_{prod} - \Delta G_{rxts}$$

$$\Delta H_{rxn} = \Delta H_{prod} - \Delta H_{rxts}$$

$$\Delta S_{rxn} = \Delta S_{prod} - \Delta S_{rxts}$$

$$E = E^0 - \frac{2.303RT}{nF} \log Q$$

$$\Delta G^0 = -nFE_{cell}^0$$

$$\Delta G^0 = RT \ln K$$

## Constants/Conversions

$$\text{Avogadro's Number} = 6.022 \times 10^{23}$$

$$\text{Planck's constant} = 6.626 \times 10^{-34} \text{ J} \times \text{s}$$

$$\text{Speed of light} = 2.998 \times 10^8 \text{ m/s}$$

$$\text{Rydberg constant} = 1.0974 \times 10^7 \text{ m}^{-1}$$

$$\text{Faraday constant} = 96485 \text{ C/mol e}^{-}$$

Standard temperature and pressure is 0°C and 1 atm

$$1 \text{ eV} = 1.602 \times 10^{-19} \text{ J}$$

$$1 \text{ calorie} = 4.184 \text{ Joules}$$

$$^{\circ}\text{F} = 1.8(^{\circ}\text{C}) + 32$$

$$\text{K} = ^{\circ}\text{C} + 273.15$$

$$1 \text{ atm} = 760 \text{ torr} = 760 \text{ mm Hg} = 101.325 \text{ kPa} = 1013.25 \text{ mbar}$$

$$R = 62.4 \frac{(\text{mm Hg} \times \text{L})}{(\text{mol} \times \text{K})} = 62.4 \frac{(\text{torr} \times \text{L})}{(\text{mol} \times \text{K})} = 0.0821 \frac{(\text{atm} \times \text{L})}{(\text{mol} \times \text{K})} = 8.314 \frac{(\text{kPa} \times \text{L})}{(\text{mol} \times \text{K})} = 83.14 \frac{(\text{mbar} \times \text{L})}{(\text{mol} \times \text{K})}$$

Lide, David R. *CRC Handbook, 83<sup>rd</sup> ed.*; CRC Press: Boca Raton, Florida, 2004; inside back cover.

## Constants for Water

Boiling point (at 1 atm):	100°C or 373.15 K
Heat of Fusion:	335 J/g
Heat of Vaporization:	2259 J/g
Triple Point:	0.01°C / 611.73 Pa
Critical Point:	373.99 °C / 22.064 MPa
Melting Point (at 1 atm):	0°C or 273.15 K
Molal Boiling Point Elevation Constant:	0.51 °C/m
Molal Freezing Point Depression Constant:	-1.86 °C/m
Molar Mass:	18.02 g
Specific Heat:	4.184 J/g °C or 1 cal/ g °C
Ion Product Constant:	$1 \times 10^{-14}$
Density at 25°C	1.00 g/cm <sup>3</sup>

Lide, David R. *CRC Handbook*, 83<sup>rd</sup> ed.; CRC Press: Boca Raton, Florida, 2004; p 6-4.