

Formulas

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

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

$$c = \lambda \nu$$

$$E = h\nu$$

$$\frac{1}{\lambda} = R \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right)$$

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

$$b = \frac{n_{\text{solute}}}{m_{\text{solvent}}}$$

$$M_1 V_1 = M_2 V_2$$

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

$$P_1 V_1 = P_2 V_2$$

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

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

$$\frac{n_1}{V_1} = \frac{n_2}{V_2}$$

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

$$PV = nRT$$

$$\frac{\text{rate}_1}{\text{rate}_2} = \sqrt{\frac{M_2}{M_1}}$$

$$KE_{\text{avg}} = \frac{3}{2} RT = \frac{1}{2} m v^2$$

$$v_{\text{rms}} = \sqrt{\frac{3kT}{m}} = \sqrt{\frac{3RT}{M}}$$

$$\Delta T_f = i K_f m$$

$$\Delta T_b = i K_b m$$

$$q = m C_p \Delta T$$

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

$$\Delta G_{\text{rxn}} = \Sigma \Delta G_{f \text{ prods}}^{\circ} - \Sigma \Delta G_{f \text{ rxts}}^{\circ}$$

$$\Delta H_{\text{rxn}} = \Sigma \Delta H_{f \text{ prods}}^{\circ} - \Sigma \Delta H_{f \text{ rxts}}^{\circ}$$

$$\Delta S_{\text{rxn}} = \Sigma \Delta S_{f \text{ prods}}^{\circ} - \Sigma \Delta S_{f \text{ rxts}}^{\circ}$$

$$\Delta G^{\circ} = RT \ln K$$

$$\Delta G^{\circ} = -n F E_{\text{cell}}^{\circ}$$

$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{RT}{nF} \ln Q$$

Constants and Conversion Factors

Avogadro's Number = 6.022×10^{23}

Boltzmann's constant = $1.38 \times 10^{-23} \text{ J K}^{-1}$

Coulomb's constant = $8.99 \times 10^9 \text{ N m}^2 \text{ C}^{-2}$

Faraday constant = 96485 C/mol e^-

Gas law constant = $0.0821 \text{ atm L mol}^{-1} \text{ K}^{-1} = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$

Gravitational constant = $6.67 \times 10^{-11} \text{ N kg}^{-2} \text{ m}^2$

Magnetic permeability = $4\pi \times 10^{-7} \text{ T m A}^{-1}$

Magnitude of electric charge = $1.60 \times 10^{-19} \text{ C}$

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

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

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

Standard temperature and pressure is 0°C and 1 atm

At standard temperature and pressure, 1 mol of gas occupies 22.414 L

Stefan-Boltzmann constant = $5.6704 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$

$m_{\text{proton}} = 1.673 \times 10^{-27} \text{ kg}$

$m_{\text{electron}} = 9.109 \times 10^{-31} \text{ kg}$

$m_{\text{neutron}} = 1.675 \times 10^{-27} \text{ kg}$

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

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

Length

1 angstrom (\AA) = 1×10^{-10} meters

1 inch = 2.54 centimeters

1 foot = 12 inches

1 meter = 3.2808 feet

1 yard = 3 feet

1 chain = 22 yards

1 furlong = 10 chains

1 mile = 5280 feet

1 mile = 1.609 kilometers

1 light year = 9.46×10^{15} meters

1 astronomical unit (AU) = 1.50×10^{11} m

1 parsec = 3.26 light years

1 degree = $\pi/180$ radians

Volume

1 gallon = 3.785 liters

1 gallon = 4 quarts

1 quart = 2 pints

1 pint = 2 cups

1 cup = 8 fluid ounces

1 fluid ounce = 29.575 mL

Mass/Weight

1 atomic mass unit = 1.6606×10^{-27}

kilograms

1 ounce = 28.35 grams

1 troy ounce = 31.103 grams

1 pound = 16 ounces

1 kilogram = 2.2046 pounds

1 stone = 14 pounds

Pressure

1 atmosphere = 760 torr

1 atmosphere = 760 mm Hg

1 atmosphere = 101.325 kilopascals

1 atmosphere = 1013.25 millibars

1 atmosphere = 14.7 pounds per square inch (psi)

Energy

1 calorie = 4.184 J

1 eV = 1.602×10^{-19} J