

# FUNDAMENTAL CONSTANTS

## Energy

- 1 joule (J) =  $1 \text{ kg} \cdot \text{m}^2 \cdot \text{s}^{-2}$
- 1 calorie (cal) = 4.184 J
- 1 V = 96.485 kJ/mol

## Force

- 1 newton (N) =  $1 \text{ kg} \cdot \text{m}/\text{s}^2$

## Length

- 1 meter (m) = 39.37 inches (in)
- 1 inch = 2.54 centimeters (cm)—exact
- $1 \text{ \AA} = 10^{-10} \text{ m}$

## Mass

- 1 kilogram (kg) = 2.205 pounds (lb)
- 1 lb = 453.6 grams (g)
- $1 \text{ amu} = 1.661 \times 10^{-24} \text{ g}$

## Pressure

- $1 \text{ atm} = 760 \text{ mm Hg (torr)} = 1.01325 \times 10^5 \text{ Pa}$

## Volume

- $1 \text{ liter (L)} = 1000 \text{ mL} = 1000 \text{ cm}^3$

## Physical Constants

Avogadro's number	$N_A = 6.0221 \times 10^{23} \text{ mol}^{-1}$
Electronic charge	$e = 1.6022 \times 10^{-19} \text{ coulomb (C)}$
Electron rest mass	$m_e = 9.1094 \times 10^{-31} \text{ kg}$
Faraday constant	$\mathcal{F} = 9.6485 \times 10^4 \text{ C} \cdot \text{mol}^{-1}$
Gas constant	$R = 0.08206 \text{ L} \cdot \text{atm} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$ $= 8.3145 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$ $= 1.9872 \text{ cal} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$
Neutron rest mass	$m_n = 1.675 \times 10^{-27} \text{ kg}$
Planck's constant	$h = 6.6261 \times 10^{-34} \text{ J} \cdot \text{s}$
Proton rest mass	$m_p = 1.6726 \times 10^{-27} \text{ kg}$
Speed of light (in vacuum)	$c = 2.9979 \times 10^8 \text{ m} \cdot \text{s}^{-1}$

## Physical Constants

## Temperature

$$\begin{aligned}0 \text{ K} &= -273.15^\circ \text{ Celsius (C)} \\ &= -459.67^\circ \text{ Fahrenheit (F)} \\ ^\circ\text{F} &= (9/5)^\circ\text{C} + 32^\circ \\ ^\circ\text{C} &= (5/9)(^\circ\text{F} - 32^\circ) \\ \text{K} &= ^\circ\text{C} + 273.15\end{aligned}$$

## SI Prefixes

- $10^9$  giga (G)
- $10^6$  mega (M)
- $10^3$  kilo (k)
- $10^{-1}$  deci (d)
- $10^{-2}$  centi (c)
- $10^{-3}$  milli (m)
- $10^{-6}$  micro ( $\mu$ )
- $10^{-9}$  nano (n)
- $10^{-12}$  pico (p)