

Physical Constants

Acceleration of gravity at
sea level and equator
Avogadro's number
Boltzmann's Constant
Electron charge
Faraday's constant
Gas constant

$$\begin{aligned}g &= 9.80665 \text{ m s}^{-2} \\ N &= 6.022045 \times 10^{23} \text{ mole}^{-1} \\ k &= 1.38066 \times 10^{-23} \text{ JK}^{-1} \text{ molecule}^{-1} \\ e &= 1.602189 \times 10^{-19} \text{ C} \\ F &= 96,484.6 \text{ C mole}^{-1} \\ R &= 8.31441 \text{ J K}^{-1} \text{ mole}^{-1} \\ R &= 0.08314 \text{ L bar K}^{-1} \text{ mole}^{-1} \\ R &= 0.082057 \text{ L atm K}^{-1} \text{ mole}^{-1}\end{aligned}$$

Conversion Factors

$$\begin{aligned}1 \text{ atm} &= 101.3 \text{ kPa} = 1.01325 \text{ bar} = 760 \text{ mm Hg} = 760 \text{ torr} \\ 0^\circ\text{C} &= 273.16 \text{ K} \\ 1 \text{ liter atm} &= 101.325 \text{ J}\end{aligned}$$

SI Scale Prefixes

Tera(T)	10^{12}	Kilo (k)	10^3	Milli (m)	10^{-3}
Giga(G)	10^9	Deci (d)	10^{-1}	Micro (μ)	10^{-6}
Mega(M)	10^6	Centi (c)	10^{-2}	Nano (n)	10^{-9}
				Pico (p)	10^{-12}

Fundamental Units

$$\begin{aligned}1 \text{ joule} &= 1 \text{ J} = 1 \text{ m}^2 \text{ kg s}^{-2} \\ 1 \text{ newton} &= 1 \text{ N} = 1 \text{ m kg s}^{-2} \\ 1 \text{ pascal} &= 1 \text{ Pa} = 1 \text{ N m}^{-2} = 1 \text{ J m}^{-3} = 1 \text{ kg m}^{-1} \text{ s}^{-2} \\ 1 \text{ watt} &= 1 \text{ W} = 1 \text{ J s}^{-1} = 1 \text{ m}^2 \text{ kg s}^{-3} \\ 1 \text{ volt} &= 1 \text{ V} = 1 \text{ J C}^{-1}\end{aligned}$$

Differentials

$$\frac{dx}{dx} = 1$$

$$\frac{dx^n}{dx} = nx^{n-1}$$

$$\frac{d \ln x}{dx} = 1/x$$

$$\frac{df(x)}{dy} = \frac{df(x)}{dx} \frac{dx}{dy}$$

Integrals

$$\int_{x_1}^{x_2} f(x) dx = - \int_{x_2}^{x_1} f(x) dx$$

$$\int_{x_1}^{x_2} dx = x_2 - x_1$$

$$\int_{x_1}^{x_2} x^n dx = \frac{x_2^{n+1} - x_1^{n+1}}{n+1}$$

$$\int_{x_1}^{x_2} \frac{dx}{x} = \ln \frac{x_2}{x_1}$$

Maxima and Minima of f(x)

At a minimum of f(x), the first derivative is zero and the second derivative is positive.

At a maximum of f(x), the first derivative is zero and the second derivative is negative.

At an inflection point of f(x), both first and second derivatives are zero.