

Basic Units

Length	the meter (m) is the distance traveled by light in a vacuum in 1/299,792,458 s
Time	The <i>second</i> (s) is the duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the ¹³³ Cs atom
Mass	The <i>kilogram</i> (kg) is the mass of the international standard body preserved at Sevres, France
Current	The <i>ampere</i> (A) is that current in two very long parallel wires 1m apart that gives rise to a magnetic force per unit length of 2x10 ⁻⁷ N/m
Temperature	The <i>Kelvin</i> (K) is 1/273.16 of the thermodynamic temperature of the triple point of water
Luminous Intensity	The <i>candela</i> (cd) is the luminous intensity, in the perpendicular direction, of a surface of area 1/600,000 m ² of a blackbody at the temperature of freezing platinum at a pressure of 1 atm

	<u>Derived Units</u>		<u>Astronomical Data</u>	
Force	Newton (N)	1 N = 1 kgm/s ²	Earth	
Work, energy	Joule (J)	1 J = 1 Nm	Distance to moon†	3.844x10 ⁸ m, 2.389x10 ⁵ mi
Power	Watt (W)	1 W = 1 J/s	Distance to sun, mean†	1.496x10 ¹¹ m, 9.30x10 ⁷ mi, 1.00 AU
Frequency	Hertz (Hz)	1 Hz = s ⁻¹	Orbital speed, mean	2.98x10 ⁴ m/s
Charge	Coulomb (C)	1 C = 1 As	Moon	
Potential	Volt (V)	1 V = 1 J/C	Mass	7.35x10 ²² kg
Resistance	Ohm (Ω)	1 Ω = 1 V/A	Radius	1.738x10 ⁶ m
Capacitance	Farad (F)	1 F = 1 C/V	Period	27.32 d
Magnetic Field	Tesla (T)	1 T = 1 N/Am	Acceleration of gravity at surface	1.62 m/s ²
Magnetic flux	Weber (Wb)	1 Wb = 1 Tm ²	Sun	
Inductance	Henry (H)	1 H = 1 J/A ²	Mass	1.99x10 ³⁰ kg
			Radius	6.96x10 ⁸ m

Terrestrial Data

Acceleration of gravity (g)	9.80665 m/s ²
Standard value	32.1740 ft/s ²
At sea level, at equator†	9.7804 m/s ²
At sea level, at pole†	9.8322 m/s ²
Mass of earth M _E	5.98x10 ²⁴ kg
Radius of earth R _E , mean	6.37x10 ⁶ m (3960 mi)
Escape speed	1.12x10 ⁴ m/s (6.95 mi/s)

$$\sqrt{2R_E g}$$

Solar constant‡	1.35 kW/m ²
Standard temperature and pressure (STP)	
Temperature	273.15 K
Pressure	101.325 kPa (1.00 atm)
Molar mass of air	28.97 g/mol
Density of air (STP), ρ _{air}	1.293 kg/m ³
Speed of sound (STP)	331 m/s
Heat of fusion of H ₂ O (0°C, 1atm)	333.5 kJ/kg
Heat of vaporization of H ₂ O (100°C, 1atm)	2.257MJ/kg

†Measured relative to the earth's surface.

‡Average power incident normally on 1m² outside the earth's atmosphere at the mean distance from the earth to the sun

Gravitational constant	G	$6.6726 \times 10^{-11} \text{Nm}^2/\text{kg}^2$
Speed of light	c	$2.99792458 \times 10^8 \text{m/s}$
Electron charge	e	$1.602177 \times 10^{-19} \text{C}$
Avogadro's number	N_A	$6.022137 \times 10^{23} \text{particles/mol}$
Gas constant	R	8.31451J/molK 1.98722cal/molK $8.20578 \times 10^{-2} \text{Latm/molK}$
Coulomb constant	$k=1/4\pi\epsilon_0$	$8.987551788 \times 10^9 \text{Nm}^2/\text{C}^2$
Permittivity of free space	ϵ_0	$8.854187817 \times 10^{-12} \text{C}^2/\text{Nm}^2$
Permeability of free space	μ_0	$4\pi \times 10^{-7} \text{N/A}^2$ $1.256637 \times 10^{-6} \text{N/A}^2$
Planck's constant	h	$6.626076 \times 10^{-34} \text{Js}$ $4.135669 \times 10^{-15} \text{eVs}$
Mass of electron	m_e	$9.109390 \times 10^{-31} \text{kg}$ $510.9991 \text{keV}/c^2$
Mass of proton	m_p	$1.672623 \times 10^{-27} \text{kg}$ $938.2723 \text{MeV}/c^2$
Mass of neutron	m_n	$1.674959 \times 10^{-27} \text{kg}$ $939.5656 \text{MeV}/c^2$

Conversion Factors

Pressure

* $1 \text{Pa} = 1 \text{N/m}^2$
* $1 \text{atm} = 101.325 \text{kPa} = 1.01325 \text{bars}$
 $1 \text{atm} = 14.7 \text{lb/in}^2 = 760 \text{mmHg} = 29.9 \text{inHg}$
 $= 33.8 \text{ftH}_2\text{O}$
 $1 \text{lb/in}^2 = 6.895 \text{kPa}$
 $1 \text{torr} = 1 \text{mmHg} = 133.32 \text{Pa}$
 $1 \text{hp} = 550 \text{ftlb/s} = 745.7 \text{W}$
 $1 \text{bar} = 100 \text{kPa}$

Area

* $1 \text{m}^2 = 10^4 \text{cm}^2$
 $1 \text{km}^2 = 0.3861 \text{mi}^2 = 247.1 \text{ acres}$
* $1 \text{in}^2 = 6.4516 \text{cm}^2$
 $1 \text{ft}^2 = 9.29 \times 10^{-2} \text{m}^2$
 $1 \text{m}^2 = 10.76 \text{ft}^2$
* $1 \text{acre} = 43,560 \text{ft}^2$
 $1 \text{mi}^2 = 640 \text{acres} = 2.590 \text{ km}^2$

Volume

* $1 \text{m}^3 = 10^6 \text{cm}^3$
* $1 \text{L} = 1000 \text{cm}^3 = 10^{-3} \text{m}^3$
 $1 \text{gal} = 3.786 \text{L}$
 $1 \text{gal} = 4 \text{qt} = 8 \text{pt} = 128 \text{oz} = 231 \text{in}^3$
 $1 \text{in}^3 = 16.39 \text{cm}^3$
 $1 \text{ft}^3 = 1728 \text{in}^3 = 28.32 \text{L} = 2.832 \times 10^4 \text{cm}^3$

Length

$1 \text{km} = 0.6215 \text{mi}$
 $1 \text{mi} = 1.609 \text{km}$
 $1 \text{m} = 1.0936 \text{yd} = 3.281 \text{ft} = 39.37 \text{in}$
* $1 \text{in} = 2.54 \text{cm}$
* $1 \text{ft} = 12 \text{in} = 30.48 \text{cm}$
* $1 \text{yd} = 3 \text{ft} = 91.44 \text{cm}$
 $1 \text{lightyear} = 1 \text{cy} = 9.461 \times 10^{15} \text{m}$

Magnetic Field

* $1 \text{G} = 10^{-4} \text{T}$
* $1 \text{T} = 10^4 \text{G}$

Time

* $1 \text{h} = 60 \text{min} = 3.6 \text{ks}$
* $1 \text{d} = 24 \text{h} = 1440 \text{min} = 86.4 \text{ks}$
 $1 \text{y} = 365.24 \text{d} = 31.56 \text{Ms}$

Speed

$1 \text{km/h} = 0.2778 \text{m/s} = 0.6215 \text{mi/h}$
 $1 \text{mi/h} = 0.4470 \text{m/s} = 1.609 \text{km/h}$
 $1 \text{mi/h} = 1.467 \text{ft/s}$

Angle and Angular Speed

* $\angle \text{rad} = 180^\circ$
 $1 \text{rad} = 57.30^\circ$
 $1^\circ = 1.745 \times 10^{-2} \text{rad}$
 $1 \text{rev/min} = 0.1047 \text{rad/s}$
 $1 \text{rad/s} = 9.549 \text{rev/min}$

Density

* $1 \text{g/cm}^3 = 1000 \text{kg/m}^3 = 1 \text{kg/L}$
 $(1 \text{g/cm}^3) \text{g} = 62.4 \text{lb/ft}^3$

Force

$1 \text{N} = 0.2248 \text{lb} = 10^5 \text{dyn}$
 $1 \text{lb} = 4.4482 \text{N}$
 $(1 \text{kg}) \text{g} = 2.2046 \text{lb}$

Thermal Conductivity

$1 \text{W/mK} = 6.938 \text{Btuin/hft}^2\text{F}^\circ$
 $1 \text{Btuin/hft}^2\text{F}^\circ = 0.1441 \text{W/mK}$

Power

$1 \text{Btu/min} = 17.58 \text{W}$
 $1 \text{W} = 1.341 \times 10^{-3} \text{hp} = 0.7376 \text{ftlb/s}$

Energy

* $1 \text{kWh} = 3.6 \text{MJ}$
* $1 \text{cal} = 4.1804 \text{J}$
 $1 \text{ftlb} = 1.356 \text{J} = 1.286 \times 10^{-3} \text{Btu}$
* $1 \text{Latm} = 101.325 \text{J}$
 $1 \text{Btu} = 778 \text{ftlb} = 252 \text{cal} = 1054.35 \text{J}$
 $1 \text{eV} = 1.602 \times 10^{-19} \text{J}$
 $1 \text{uc}^2 = 931.50 \text{MeV}$
* $1 \text{erg} = 10^{-7} \text{J}$

Mass

* $1 \text{kg} = 1000 \text{g}$
* $1 \text{tonne} = 1000 \text{kg} = 1 \text{Mg}$
 $1 \text{u} = 1.6606 \times 10^{-27} \text{kg}$
 $1 \text{kg} = 6.022 \times 10^{23} \text{u}$
 $1 \text{slug} = 14.59 \text{kg}$
 $1 \text{kg} = 6.852 \times 10^{-2} \text{slug}$
 $1 \text{u} = 931.50 \text{MeV}/c^2$