

Physical Constants and Conversion Factors

(1) Units of length

1 meter = 1 m
1 mile = 1609 m
1 foot = 0.3048 m
1 inch = 2.54 cm

(2) Units of time

1 second = 1 s
1 minute = 60 s
1 hour = 3600 s
1 day = 86,400 s

(3) Units of mass

1 kilogram = 1 kg
1 gram = 0.001 kg

(4) Units of velocity

1 ft/s = 0.3048 m/s
1 mi/hr = 0.44704 m/s

(5) Units of force

1 newton (N) = 1 kg m/s²
1 pound = 4.4482 N
1 pound = weight of 0.45359 kg (on Earth)

(6) Units of energy or work

1 joule = 1 newton-meter
1 J = 1 N m
1 Calorie = 4184 J
1 kilowatt-hour = 3.6 x 10⁶ J

(7) Units of power

1 watt = 1 joule per second
1 W = 1 J/s

(8) Units of pressure

1 pascal (Pa) = 1 N/m²
1 atmosphere = 1.013 x 10⁵ Pa

(9) Units of temperature

Celsius: T in C = (5/9) (T in F - 32)
Kelvin: T in K = T in C + 273.15

(10) Gravity

Acceleration due to Earth's gravity
 $g = 9.81 \text{ m/s}^2$
Newton's gravitational constant
 $G = 6.67 \times 10^{-11} \text{ m}^3 \text{ s}^{-2} \text{ kg}^{-1}$

(11) Earth

Radius of the Earth
 $R = 6731 \text{ km} = 6.37 \times 10^6 \text{ m}$
Mass of the Earth
 $M = 5.974 \times 10^{24} \text{ kg}$
 $GM = gR^2$
Radius of Earth's orbit
 $r = 93 \text{ million miles}$
 $r = 1.46 \times 10^{11} \text{ m}$
 $r = 1 \text{ AU (astronomical unit)}$

(12) Moon

Mass of the moon
 $M = 7.348 \times 10^{22} \text{ kg}$
Radius of Moon's orbit
 $r = 3.844 \times 10^8 \text{ m}$

(13) Sun

Mass of the sun
 $M = 1.989 \times 10^{30} \text{ kg}$
 $GM = 4\pi^2 \text{ AU}^3/\text{y}^2$

(14) Fluids

Density of water
 $\rho = 1.0 \times 10^3 \text{ kg/m}^3$
Air pressure at STP
 $p = 1 \text{ atmosphere}$
 $p = 1.013 \times 10^5 \text{ Pa}$