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
\[ R = 6371 \text{ km} = 6.37 \times 10^6 \text{ m} \]
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
\[ M = 1.989 \times 10^{30} \text{ kg} \]
\[ GM = 4\pi^2 \text{ AU}^3/y^2 \]

(14) Fluids
Density of water
\[ \rho = 1.0 \times 10^3 \text{ kg/m}^3 \]
Air pressure at STP
\[ p = 1 \text{ atmosphere} \]
\[ p = 1.013 \times 10^5 \text{ Pa} \]