

Fundamental constants

Universal gas constant (R^*)	8.3143 J K ⁻¹ mol ⁻¹
Boltzmann's constant (k)	1.38×10^{-23} J K ⁻¹
Stefan-Boltzmann constant (σ)	5.67×10^{-8} W m ⁻² K ⁻⁴
Planck's constant (\hbar)	6.63×10^{-34} J s
Speed of light (c^*)	2.998×10^8 m s ⁻¹
Gravitational constant	6.67×10^{-11} Nt m ² kg ⁻²
Avogadro Number (N_A)	6.022×10^{23} particles mol ⁻¹

Sun

Luminosity	3.92×10^{26} W
Mass	1.99×10^{30} kg
Radius	6.96×10^8 m

Earth

Average radius (a)	6.37×10^6 m
Equatorial radius	6.378×10^6 m
Polar radius	6.357×10^6 m
Standard gravity	9.80665 m s ⁻²
Mass of Earth	5.983×10^{24} kg
Mass of ocean	1.4×10^{21} kg
Mass of atmosphere	5.136×10^{18} kg
Mean angular rotation rate (Ω)	7.292×10^{-5} rad s ⁻¹
Solar constant (S_o)	1367 ± 2 W m ⁻²
Mean distance from sun	1.496×10^{11} m
Planetary albedo	0.30

Dry air

Average molecular weight (m_a)	28.97 g mol ⁻¹
Gas constant (R)	287 J K ⁻¹ kg ⁻¹
Density as 0° C and 101,325 Pa	1.293 kg m ⁻³
Specific heat at constant pressure (c_p)	1004 J K ⁻¹ kg ⁻¹
Specific heat at constant volume (c_v)	717 J K ⁻¹ kg ⁻¹

Water

Molecular weight (m_v)	18.016 g mol ⁻¹
Gas constant for vapor ($R_v = R^*/m_w$)	461 J K ⁻¹ kg ⁻¹
Density of pure water at 0° C	1000 kg m ⁻³
Density of ice at 0° C	917 kg m ⁻³
Specific heat of vapor at constant pressure	1952 J K ⁻¹ kg ⁻¹
Specific heat of vapor at constant volume	1463 J K ⁻¹ kg ⁻¹
Specific heat of liquid water at 0° C	4218 J K ⁻¹ kg ⁻¹
Specific heat of ice at 0° C	2106 J K ⁻¹ kg ⁻¹

Latent heat of vaporization at 0° C	$2.5 \times 10^6 \text{ J kg}^{-1}$
Latent heat of vaporization at 100° C	$2.25 \times 10^6 \text{ J kg}^{-1}$
Latent heat of fusion at 0° C	$3.34 \times 10^5 \text{ J kg}^{-1}$

CO₂

Molecular weight (m_v)	44.01 g mol ⁻¹
Density of dry ice	1500 kg m ⁻³
parts per million by volume in dry air (1990)	353 ppmv
Mass in atmosphere (1990)	$2.76 \times 10^{15} \text{ kg}$

Soil

Specific heat of inorganic soil	733 J kg ⁻¹ K ⁻¹
Density of inorganic soil	2600 kg m ⁻³
Specific heat of organic soil	1921 J kg ⁻¹ K ⁻¹
Density of organic soil	1300 kg m ⁻³
Thermal conductivity of dry peat	0.1 W m ⁻¹ K ⁻¹
Thermal conductivity of typical soil	1.0 W m ⁻¹ K ⁻¹
Thermal conductivity of wet sand	2.5 W m ⁻¹ K ⁻¹

Useful conversions

1 millibar (mb)	= 10 ² Pascal (Pa)
1 nautical mile (nmi)	= 1852 meter (m)
1 mile (mi)	= 1609.344 meter (m)
1 knot (kt)	= 0.514444 meter sec ⁻¹ (m s ⁻¹)
1 year (yr)	= 3.15569 10 ⁷ sec (s)
1 feet (ft)	= 0.30480 meter (m)
1 mile (mi)	= 5280 feet (ft)
1 atmosphere (atm)	= 101325 Pascal (Pa)