



Department of Meteorology and Atmospheric Science

Meteorological Measurements, Units, and Conversions

Welcome! This page is useful to meteorologists who need help remembering units, constants, and abbreviations. Scroll down to examine or use the find function within your browser to search within the page.

Fundamental Units

Quantity	Name of unit	Abbreviation
Length	meter	m
Mass	kilogram	kg
Time	second	s
Electrical Current	ampere	A
Temperature	kelvin	K

Derived Units

Quantity	Name of unit	Symbol	SI Units
Force	newton	N	kg m s^{-2}
Pressure	pascal	Pa	$\text{N m}^{-2} = \text{kg m}^{-1} \text{s}^{-2}$
Energy	joule	J	$\text{kg m}^2 \text{s}^{-2}$
Power	watt	W	$\text{J s}^{-1} = \text{kg m}^2 \text{s}^{-3}$
Electrical Potential Difference	volt	V	$\text{W A}^{-1} = \text{kg m}^2 \text{s}^{-3} \text{A}^{-1}$

Quantity	Name of unit	Symbol	SI Units
Electrical Charge	coulomb	C	A s
Electrical Resistance	ohm	W	$V A^{-1} = kg m^2 s^{-3} A^{-2}$
Electrical Capacitance	farad	F	$A s V^{-1} = kg^{-1} m^{-2} s^4 A^2$
Frequency	hertz	Hz	s^{-1}
Sound Level	decibel	dB	$10 \log (p_1/p_2)$
Celsius Temperature	degree	°C	K - 273.15
Temperature Interval	degree	deg or °	either K or °C

Useful Unit Conversions

Quantity	English	SI
Velocity	1 mph; 1 knot	0.45 m/s; 0.514 m/s
Temperature	°F	$(°F - 32)(5/9) = °C$
Length	39.4 in	1 m
Pressure	1 psi	6895 Pa
Mass	1 lb	0.45 kg
Energy	1 ft lb	1.36 J
Volume	1 gal	$3.8 \times 10^{-3} m^3$

Standard Atmosphere

1 atm 1013.25 mb; 760 mmHg; 29.921 inHg; 14.7 lb in-2

Other Units

Quantity	Name of unit	Symbol	Fundamental Units
Volume	liter	l	$10^{-3} m^3$
Pressure	millibar	mbar or mb	$10^2 Pa$

Decimal Multiples of Units

Multiple	Prefix	Symbol
10 ⁻¹	deci	d
10 ⁻²	centi	c
10 ⁻³	milli	m
10 ⁻⁶	micro	μ
10 ⁻⁹	nano	n
10 ⁻¹²	pico	p
10 ⁻¹⁵	femto	f
10 ⁻¹⁸	atto	a
10 ¹	deca; deka	da
10 ²	hecto	h
10 ³	kilo	k
10 ⁶	mega	M
10 ⁹	giga	G
10 ¹²	tera	T

Useful Physical Constants

Name of the Constant	Abbreviation	Value and Units
Universal Gas Constant	R*	8.3145 x 10 ³ J K ⁻¹ mol ⁻¹
Boltzmann's Constant	k	1.381 x 10 ⁻²³ J K ⁻¹ molecule ⁻¹
Avogadro's Number	N _A	6.022 x 10 ²³ mol ⁻¹
Stefan-Boltzmann Constant	s	5.6696 x 10 ⁻⁸ W m ⁻² K ⁻⁴
Planck's Constant	h	6.6262 x 10 ⁻³⁴ J s

Name of the Constant	Abbreviation	Value and Units
Velocity of Light	c	$2.998 \times 10^8 \text{ m s}^{-1}$
Permittivity of Vacuum	ϵ_0	$8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
Average Radius of the Earth	R_E	$6.37 \times 10^6 \text{ m}$
Mean Gravity at Earth's Surface	g_0, g	9.81 m s^{-2}
Angular Velocity of Rotation of the Earth	W	$7.292 \times 10^{-5} \text{ rad s}^{-1}$
Average Distance from the Center of the Sun to the Center of the Earth	d, d_0	$1.50 \times 10^{11} \text{ m}$
Solar Irradiance on a Perpendicular Plane at the mean Earth-Sun Distance	S_0	$1.367 \times 10^3 \text{ W m}^{-2}$
Average Molecular Weight of Dry Air	M_d	28.97
Gas Constant of Dry Air	R_d	$287 \text{ J K}^{-1} \text{ kg}^{-1}$
Density of Dry Air at 0°C and 1000mb	r_d	1.275 kg m^{-3}
Specific Heat of Dry Air at Constant Pressure	c_{pd}	$1004 \text{ J K}^{-1} \text{ kg}^{-1}$
Specific Heat of Dry Air at Constant Volume	c_{vd}	$717 \text{ J K}^{-1} \text{ kg}^{-1}$
Thermal Conductivity of Dry Air at 0°C	k	$2.40 \times 10^{-2} \text{ J m}^{-1} \text{ s}^{-1} \text{ K}^{-1}$
Molecular Weight of Water	M_w	18.016
Gas Constant for Water Vapor	R_v	$461 \text{ J K}^{-1} \text{ kg}^{-1}$
Density of Liquid Water at 0°C	r_w	$1.00 \times 10^3 \text{ kg m}^{-3}$
Density of Ice at 0°	r_i	$0.917 \times 10^3 \text{ kg m}^{-3}$
Specific Heat of Water Vapor at Constant Pressure	c_{pv}	$1952 \text{ J K}^{-1} \text{ kg}^{-1}$

Name of the Constant	Abbreviation	Value and Units
Specific Heat of Water Vapor at Constant Volume	c_{vv}	1463 J K ⁻¹ kg ⁻¹
Specific Heat of Water Vapor at 0°C	c_w	4218 J K ⁻¹ kg ⁻¹
Specific Heat of Ice at 0°C	c_i	2106 J K ⁻¹ kg ⁻¹
Enthalpy (Latent Heat) of Vaporization of Water at 0°C	l_v	2.50 x 10 ⁶ J kg ⁻¹
Enthalpy (Latent Heat) of Vaporization of Water at 100°C	l_v	2.25 x 10 ⁶ J kg ⁻¹
Enthalpy (Latent Heat) of Fusion of Water at 0°C	l_f	3.34 x 10 ⁵ J kg ⁻¹
Enthalpy (Latent Heat) of Sublimation of Water at 0°C	l_s	2.83 x 10 ⁶ J kg ⁻¹