

# Chapter 7

## Constants library

The constants library contains a collection of commonly used physical constants and quantities. You can use them in equations and programs.

The following table lists the constants in the order they appear in the library.

Abbreviation	Description	Value (SI)
NA	Avogadro's number	6.0221367E23 gmol <sup>-1</sup>
k	Boltzmann constant	1.380658E-23 J/K
Vm	Molar volume	22.4141 l/gmol
R	Universal gas constant	8.31451 J/(gmol·K)
StdT	Standard temperature	273.15 K
StdP	Standard pressure	101.325 kPa
σ	Stefan-Boltzmann constant	5.67051E-8 W/(m <sup>2</sup> ·K <sup>4</sup> )
c	Speed of light in vacuum	299792458 m/s
ε0	Permittivity of vacuum	8.85418781761E-12 F/m
μ0	Permeability of vacuum	1.25663706144E-6 H/m
g	Acceleration of gravity	9.80665 m/s <sup>2</sup>
G	Gravitational constant	6.67259E-11 m <sup>3</sup> /(s <sup>2</sup> ·kg)
h	Planck's constant	6.6260755E-34 J·s
hbar	Dirac's constant	1.05457266E-34 J·s
q	Electron charge	1.60217733E-19 C
me	Electron rest mas	9.1093897E-31 kg
qme	q/me	175881962000 C/kg

Abbreviation	Description	Value (SI)
mp	Proton rest mass	1.6726231E-27 kg
mpme	mp/me	1836.152701
$\alpha$	Fine structure constant	0.00729735308
$\phi$	Magnetic flux quantum	2.06783461E-15 Wb
F	Faraday constant	96485.309 C/gmol
$R_{\infty}$	Rydberg constant	10973731.534 m <sup>-1</sup>
a0	Bohr radius	0.0529177249 nm
$\mu_B$	Bohr magneton	9.2740154E-24 J/T
$\mu_N$	Nuclear magneton	5.0507866E-27 J/T
$\lambda_0$	Photon wavelength (ch/e)	1239.8425 nm
f0	Photon frequency (e/h)	2.4179883E14 Hz
$\lambda_c$	Compton wavelength	0.00242631058 nm
rad	1 radian	1 radian
two $\pi$	2 $\pi$ radians	6.28318530718 radians
angl	$\sphericalangle$ in trig mode	180°
c3	Wien displacement constant	0.002897756 m·K
kq	k/q	0.00008617386 J/(K·C)
$\epsilon_0 q$	$\epsilon_0/q$	55263469.6 F/(m·C)
qe0	$q^*\epsilon_0$	1.4185979E-30 F·C/m
$\epsilon_{si}$	Dielectric constant	11.9
$\epsilon_{ox}$	SiO <sub>2</sub> dielectric constant	3.9
I0	Reference intensity	0.000000000001 W/m <sup>2</sup>

## To view the constants library

1. Press **(APPS)** **CONSTANTS LIB.**
2. Press **(ENTER)**.

**In RPN mode:** follow step 1 only.

## To view the value and units of a particular constant

1. Highlight the constant whose value you want to see.  
You can either press **(▼)** or **(▲)** until the constant is highlighted, or press **(ALPHA)** followed by the first character of the constant's abbreviation. For example, to quickly find the acceleration of gravity, enter **(ALPHA)** **(G)**. (The left-shift key is needed because the abbreviation for the deceleration of gravity is a lower-case *g*.)
2. Press **VALUE**.  
The numerical value of the constant is displayed.
3. If the units are not displayed and you wish to see them, press **UNITS**.
4. If SI units are displayed and you prefer imperial units, press **ENGL**.  
(Alternatively, if imperial units are displayed and you prefer to see SI units, press **SI**.)

## To copy a constant to the stack or history

1. Highlight the constant whose value you want to copy.  
You can either press **(▼)** or **(▲)** until the constant is highlighted, or press **(ALPHA)** followed by the first character of the constant's abbreviation.
2. If you want to copy the value and its units, display the units. (If the units are not displayed, press **UNITS**.)
3. Press **→STK**.

Once copied to the stack or history, you can include the value or unit object in calculations.

To return to the stack or history, press **QUIT** or **(CANCEL)**.

# To include a constant in an algebraic expression

You can include a constant in an expression you are creating on the command line or in Equation Writer.

1. At the position in the expression where you want to include a constant, type CONST.
2. Press  $\left[ \left( \right) \right]$ .
3. With the cursor between the parentheses, type the abbreviation for the constant.

For example:  $4.56 * \text{CONST}(g)$ .

When the expression is evaluated, the constant is also evaluated. (In the above example, the answer, in SI units, is  $44.718824\_m/s^2$ .)