



General Data and Fundamental Constants

Speed of light in vacuum	c_0	299 792 458 m s ⁻¹ (defined)
Elementary charge	e	1.602 176 53(14) × 10 ⁻¹⁹ C
Boltzmann constant	k, k_B	1.380 650 5(24) × 10 ⁻²³ J K ⁻¹
Planck constant	h $\hbar = h/2\pi$	6.626 069 3(11) × 10 ⁻³⁴ J s 1.054 571 68(18) × 10 ⁻³⁴ J s
Avogadro constant	L, N_A	6.022 141 5(10) × 10 ²³ mol ⁻¹
Gas constant	R	8.314 472 (15) J K ⁻¹ mol ⁻¹
Faraday constant	F	9.648 533 83(83) × 10 ⁴ C mol ⁻¹

Atomic mass constant (dalton, or unified atomic mass unit, $m(^{12}\text{C})/12$)	$m_u = \text{Da} = u$	1.660 538 86(28) × 10 ⁻²⁷ kg
Electron rest mass	m_e	9.109 382 6(16) × 10 ⁻³¹ kg
Proton rest mass	m_p	1.672 621 71(29) × 10 ⁻²⁷ kg
Neutron rest mass	m_n	1.674 927 28(29) × 10 ⁻²⁷ kg

Permeability of vacuum (or magnetic constant)	μ_0	4 π × 10 ⁻⁷ H m ⁻¹ (defined) Note: H m ⁻¹ = N A ⁻² = N s ² C ⁻²
Permittivity of vacuum (or electric constant)	$\epsilon_0 = 1/\mu_0 c_0^2$	8.854 187 816... × 10 ⁻¹² F m ⁻¹ Note: F m ⁻¹ = C ² J ⁻¹ m ⁻¹
Bohr magneton	$\mu_B = e \hbar / 2m_e$	9.274 009 49(80) × 10 ⁻²⁴ J T ⁻¹
Nuclear magneton	$\mu_N = (m_e / m_p) \mu_B$	5.050 783 43(43) × 10 ⁻²⁷ J T ⁻¹
Landé g -factor for free electron	g_e	2.002 319 304 371 8(75)

Fine structure constant	$\alpha = \mu_0 e^2 c_0 / 2h$	7.297 352 568(24) × 10 ⁻³
Second radiation constant	$c_2 = hc_0/k$	1.438 775 2(25) × 10 ⁻² m K
Stefan-Boltzmann constant	$\sigma = 2\pi^5 k^4 / 15h^3 c_0^2$	5.670 400(40) × 10 ⁻⁸ W m ⁻² K ⁻⁴
Bohr radius	$a_0 = 4\pi \epsilon_0 \hbar^2 / m_e e^2$	5.291 772 108(18) × 10 ⁻¹¹ m
Hartree energy	$E_h = \hbar^2 / m_e a_0^2$	4.359 744 17(75) × 10 ⁻¹⁸ J
Rydberg constant	$R_\infty = E_h / 2hc_0$	1.097 373 156 852 5(73) × 10 ⁷ m ⁻¹

Standard acceleration of free fall g_n	9.806 65 m s ⁻² (defined)
Gravitational constant G	6.674 2(10) × 10 ⁻¹¹ m ³ kg ⁻¹ s ⁻²
Zero of Celsius scale	273.15 K (defined)
Molar volume of ideal gas, $\rho = 1$ bar and $T = 273.15$ K	22.710 981 (40) L mol ⁻¹
Standard atmosphere	101 325 Pa (defined)
RT at 298.15 K	2.4790 kJ mol ⁻¹

PRESSURE CONVERSION FACTORS

	Pa	atm	Torr
1 Pa =	1	9.869 23 × 10 ⁻⁶	7.500 62 × 10 ⁻³
1 atm =	101 325	1	760
1 Torr =	133.322	1.315 79 × 10 ⁻³	1

Example of the use of this table: 1 atm = 101 325 Pa
Notes: 1 mmHg = 1 Torr ; 1 bar = 10⁵ Pa

ENERGY CONVERSION FACTORS

	energy E			molar energy	wavenumber
	J	eV	E_h	E_m	$\tilde{\nu}$
1 aJ	10 ⁻¹⁸	6.241 509	0.229 3713	602.2142	50 341.17
1 eV	1.602 177 × 10 ⁻¹⁹	1	3.674 932 × 10 ⁻²	96.485 34	8 065.544
1 E_h	4.359 744 × 10 ⁻¹⁸	27.211 38	1	2625.500	219 474.6
1 kJ/mol	1.660 539 × 10 ⁻²¹	1.036 427 × 10 ⁻²	3.808 799 × 10 ⁻⁴	1	83.593 47
1 cm ⁻¹	1.986 446 × 10 ⁻²³	1.239 842 × 10 ⁻⁴	4.556 335 × 10 ⁻⁶	11.962 66 × 10 ⁻³	1

Example of the use of this table: 1 eV 'corresponds to' or 'is equivalent to' 96.485 34 kJ/mol
Note: 1 cal = 4.184 J

Source: The National Institute of Standards and Technology (NIST) reference on Constants, Units, and Uncertainties (2002 values)
<<http://physics.nist.gov/cuu/constants>>