Fundamental Physical Constants / Naturkonstanten

Note: This page requires a browser capable of math mode, e.g., Arena

- Version of this page not using math mode / Version ohne "math mode"
- PostScript Version *(rendered by html2ps)*

(without warranty / ohne Gewähr)
Exponent (base 10) of decimal numbers: e *n* = 10^n .
Units are separated by spaces, positive numbers denote powers, all units to the right of the slash are in the denominator (negative powers).

Planck constant / Plancksches Wirkungsquantum *h*:
6.6260755e−34 J s
$\frac{h}{2\pi}$ = 1.05457266e−34 J s

Boltzmann constant / Boltzmannsche Konstante
k_B : 1.380658e−23 J/K

Elementary charge / Elementarladung *e*:
1.60217733e−19 C

Avogadro number / Avogadrosche Zahl
N_A : 6.0221367e23 particles/mol

Speed of light / Lichtgeschwindigkeit *c*:
2.99792458e8 m/s

Permeability of vacuum / Permeabilität des Vakuums
$\mu_0 = 4\pi$ e−7 T^2m^3/J
12.566370614e−7 T^2m^3/J

Permittivity of vacuum / Dielektrizitätskonstante
$\varepsilon_0 = \frac{1}{\mu_0 c^2}$
8.854187817e−12 C^2/Jm

Fine structure constant / Feinstrukturkonstante
1 / α = 137.0359895

Electron rest mass / Elektronenruhemasse
m_e : 9.1093897e−31 kg

Proton rest mass / Protonenruhemasse
m_p : 1.6726231e−27 kg

Neutron rest mass / Neutronenruhemasse
m_n : 1.6749286e−27 kg

Bohr magneton / Bohrsches Magneton
$\mu_B = \frac{eh}{4\pi m_e}$
9.2740154e−24 J/T

Nuclear magneton / Kernmagneton

$\mu_N = \frac{eh}{4\pi m_p}$

5.0507866e−27 J/T

Free electron g factor / g−Faktor des freien Elektrons

g_e = 2.002319304386

Free electron gyromagnetic ratio / gyromagnetisches Verhältnis des freien Elektrons

$\gamma_e = \frac{2\pi g_e \mu_B}{h}$

1.7608592e11 1/s T

$\frac{\gamma_e}{2\pi}$ = 28.024944 GHz/T

Electron magnetic moment / magnetisches Moment des Elektrons

$\mu_e = -\frac{1}{2} g_e \mu_B$

−9.2847701e−24 J/T

Proton gyromagnetic ratio (H2O) / gyromagnetisches Verhältnis der Protonen in Wasser

γ_p = 2.67515255e8 1/s T

$\frac{\gamma_p}{2\pi}$ = 42.576375 MHz/T

Proton magnetic moment / magnetisches Moment des Protons

μ_p = 1.41060761e−26 J/T

Proton−electron ratios / Proton−Elektron−Verhältnisse

$\frac{m_p}{m_e}$ = 1836.152701

$\frac{\mu_e}{\mu_p}$ = 658.2106881

$\frac{\gamma_e}{\gamma_p}$ = 658.2275841 (protons in water)

Charge−to−mass ratio for electron / Ladungs−Masse−Verhältnis des Elektrons

$\frac{e}{m_e}$ = 1.75880e11 C/kg

Atomic mass unit / Einheit der Atommasse amu:

1.66057e−27 kg

Bohr radius / Bohrscher Radius

a_0 : 5.29177e−11 m

Electron radius / Elektronenradius

r_e : 2.81792e−15 m

Gas constant / Gaskonstante *R*:

R = $N_A k_B$

8.31451 $m^2 kg/s^2 K mol$

Molar volume / Molvolumen

V_{mol} : 22.41383 $m^3/kmol$

Faraday constant / Faradaysche Konstante *F*:

F = $N_A e$

9.64846e4 C/mol

Proton g factor (Lande factor) / g−Faktor des Protons

g_H : 5.585

Gravitational constant / Gravitationskonstante *G*

6.672e−11 m^3/kgs^2 *(note: there is controversy about the accurate value of G)*

6.6732e−11 m^3/kgs^2 *(from: BRUKER Almanac 1988, possibly inaccurate)*

Acceleration due to gravity / Erdbeschleunigung *g*:

9.80665 m/s^2

Compton wavelength of the electron / Compton−Wellenlänge des Elektrons

$\lambda_c = \frac{h}{m_e c}$

2.42631e−12 m

Further Useful Constants / Weitere nützliche Konstanten

Atomic energy unit / atomare Energieeinheit **Hartree**

1 Hartree = $\frac{e^2}{4\pi\varepsilon_0 a_0}$

1 Hartree = 2.625501e+06 J/mol (approx. 627.5 kcal/mol)

Useful Conversion Factors / Nützliche Umrechnungsfaktoren

NMR (Nuclear Magnetic Resonance)

Proton Larmor frequency

$\nu_p = \frac{\gamma_p}{2\pi} B$

ν_p = 42.5764 MHz/T (H_2O)

EPR (Electron Paramagnetic Resonance, ESR)

Electron Larmor frequency

$\nu_e = \frac{\gamma_e}{2\pi} \frac{g}{g_e} B$

ν_e / GHz = 13.9962 *g B* / T

g = 0.07144775 $\frac{\nu_e/GHz}{B/T}$

g = 3.04199 $\frac{\nu_e/GHz}{\nu_p/MHz}$

B / T = 0.0234872 ν_p / MHz

Conversion of Units

1 G = 0.1 mT

1 T = 10 kG

1 mT = 10 G

A / MHz = 2.80249 $\frac{g}{g_e} A$ / G

A / MHz = 28.0249 $\frac{g}{g_e} A$ / mT

A / MHz = 13.9962 g A / mT

A / MHz = 2.99792e4 A / cm^{-1}

A / cm^{-1} = 0.333564e−4 A / MHz

A / cm^{-1} = 4.66863e−4 g A / mT

- The NIST Reference on Constants, Units, and Uncertainty
  - CODATA Internationally recommended values of the Fundamental Physical Constants
- Fundamental constants C Header File, FORTRAN Data File
- Conversion of units / Umrechnung von Einheiten
- Physical Constants and Astronomical Data *(U Wisconsin)*
- Scientific Constants *(UIUC)*
- Index General chemistry / Allgemeine Chemie

Note: Physical quantities should be typeset in an *italic* font, whereas units should be typeset in a regular (non−italic) font. Due to problems with currently available browsers, this page (or parts of it) may not be rendered according to these rules.

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