# Fundamental Constants

2018 CODATA values from NIST, at `http://physics.nist.gov/cuu/Constants`

Numbers in parentheses are uncertainties in the last two digits of the listed value.

| | | |
|---|---|---|
| speed of light in vacuum | $c = 299\,792\,458\,\mathrm{m/s}$ (exact) | |
| Planck constant | $h = 6.626\,070\,15 \times 10^{-34}\,\mathrm{J{\cdot}s}$ (exact) | |
| | $\hbar = 1.054\,571\,818\,\cdots \times 10^{-34}\,\mathrm{J{\cdot}s}$ | |
| | $hc = 1240\cdots\,\mathrm{eV{\cdot}nm}$ | |
| constant of gravitation | $G = 6.674\,30(15) \times 10^{-11}\,\mathrm{N{\cdot}m^2/kg^2}$ | |
| Coulomb force constant | $k_\mathrm{C} = 8.987\,551\,792\,2(13) \times 10^{9}\,\mathrm{N{\cdot}m^2/C^2}$ | |
| permittivity constant | $\epsilon_0 = 8.854\,187\,812\,8(13) \times 10^{-12}\,\mathrm{C^2/N{\cdot}m^2}$ | |
| permeability constant | $\mu_0 = 4\pi \times 1.000\,000\,000\,54(15) \times 10^{-7}\,\mathrm{N/A^2}$ | |
| elementary charge | $e = 1.602\,176\,634 \times 10^{-19}\,\mathrm{C}$ (exact) | |
| Avogadro constant | $N_A = 6.022\,140\,76 \times 10^{23}\,\mathrm{molecules/mol}$ (exact) | |
| Boltzmann constant | $k_B = 1.380\,649 \times 10^{-23}\,\mathrm{J/K}$ (exact) | $\simeq 8.62 \times 10^{-5}\,\mathrm{eV/K}$ |
| electron mass | $m_e = 9.109\,383\,7015(28) \times 10^{-31}\,\mathrm{kg}$ | $\simeq 0.511\,\mathrm{MeV}/c^2$ |
| proton mass | $m_p = 1.672\,621\,923\,69(51) \times 10^{-27}\,\mathrm{kg}$ | $\simeq 938.3\,\mathrm{MeV}/c^2$ |
| neutron mass | $m_n = 1.674\,927\,498\,04(95) \times 10^{-27}\,\mathrm{kg}$ | $\simeq 939.6\,\mathrm{MeV}/c^2$ |
| electron magnetic moment | $\mu_e = -9.284\,764\,7043(28) \times 10^{-24}\,\mathrm{J/T}$ | |
| proton magnetic moment | $\mu_p = 1.410\,606\,797\,36(60) \times 10^{-26}\,\mathrm{J/T}$ | |

# Miscellaneous Physical Data

| | | |
|---|---|---|
| gravitational field strength (sea level) | $g = 9.81\,\mathrm{N/kg}$ | |
| sun: | mass $= 1.99 \times 10^{30}\,\mathrm{kg}$ | radius $= 6.96 \times 10^{8}\,\mathrm{m}$ |
| earth: | mass $= 5.97 \times 10^{24}\,\mathrm{kg}$ | radius $= 6.37 \times 10^{6}\,\mathrm{m}$ |
| moon: | mass $= 7.35 \times 10^{22}\,\mathrm{kg}$ | radius $= 1.74 \times 10^{6}\,\mathrm{m}$ |

mean earth-sun distance $= 1.50 \times 10^{11}\,\mathrm{m}$

mean earth-moon distance $= 3.84 \times 10^{8}\,\mathrm{m}$

# Metric Prefixes

| | | | |
|---|---|---|---|
| centi | $\mathrm{c} = 10^{-2}$ | | |
| milli | $\mathrm{m} = 10^{-3}$ | kilo | $\mathrm{k} = 10^{3}$ |
| micro | $\mu = 10^{-6}$ | mega | $\mathrm{M} = 10^{6}$ |
| nano | $\mathrm{n} = 10^{-9}$ | giga | $\mathrm{G} = 10^{9}$ |
| pico | $\mathrm{p} = 10^{-12}$ | tera | $\mathrm{T} = 10^{12}$ |
| femto | $\mathrm{f} = 10^{-15}$ | peta | $\mathrm{P} = 10^{15}$ |