TZDII[1] INSIDE FRONT COVER

PHYSICAL CONSTANTS & CONVERSION FACTORS

(For the most accurate known values and a few more constants see Appendix A.)

Named Constants

Atomic mass unit:	$1\text{u} = \frac{1}{12}\text{m}(^{12}\text{C atom}) = 1.66 \times 10^{-27}\text{ kg} = 931.5\text{ MeV}/c^2$
Avogadro's constant:	$N_A = 6.02 \times 10^{23}\text{ particles/mole}$
Bohr magneton:	$\mu_B = e\hbar/(2m_e) = 5.79 \times 10^{-5}\text{ eV/T} = 9.27 \times 10^{-24}\text{ J/T(or A} \cdot \text{m}^2)$
Bohr radius:	$a_B = \hbar^2/(ke^2m_e) = 5.29 \times 10^{-11}\text{ m}$
Boltzmann's constant:	$k_B = 8.62 \times 10^{-5}\text{ eV/K} = 1.38 \times 10^{-23}\text{ J/K}$
Coulomb force constant:	$k = 1/(4\pi\varepsilon_0) = \mu_0c^2/(4\pi) = 8.99 \times 10^9\text{ N} \cdot \text{m}^2/\text{C}^2$
Electron Compton wavelength:	$\lambda_c = h/(m_ec) = 2.43 \times 10^{-12}\text{ m}$
Electron volt:	$1\text{eV} = 1.60 \times 10^{-19}\text{ J}$
Elementary charge:	$e = 1.60 \times 10^{-19}\text{ C}$
Fine-structure constant:	$\alpha = ke^2/(\hbar c) = 7.30 \times 10^{-3} \approx 1/137$
Gas constant:	$R = 8.31\text{ J/(mole} \cdot \text{K)} = 0.0821\text{ liter} \cdot \text{atm/(mole} \cdot \text{K)}$
Gravitational constant:	$G = 6.67 \times 10^{-11}\text{ N} \cdot \text{m}^2/\text{kg}^2$
Mass of electron:	$m_e = 5.49 \times 10^{-4}\text{ u} = 9.11 \times 10^{-31}\text{ kg} = 0.511\text{ MeV}/c^2$
Mass of proton:	$m_p = 1.007\text{ u} = 1.673 \times 10^{-27}\text{ kg} = 938.3\text{ MeV}/c^2$
Mass of neutron:	$m_n = 1.009\text{ u} = 1.675 \times 10^{-27}\text{ kg} = 939.6\text{ MeV}/c^2$
Nuclear magneton:	$\mu_N = e\hbar/(2m_p) = 3.15 \times 10^{-8}\text{ eV/T} = 5.05 \times 10^{-27}\text{ J/T}$
Permeability of space:	$\mu_0 = 4\pi \times 10^{-7}\text{ N/A}^2 = 1.26 \times 10^{-6}\text{ N/A}^2$
Permittivity of space:	$\varepsilon_0 = 1/(\mu_0c^2) = 8.85 \times 10^{-12}\text{ C}^2/(\text{N} \cdot \text{m}^2)$
Planck's constants:	$h = 6.63 \times 10^{-34}\text{ J} \cdot \text{s} = 4.14 \times 10^{-15}\text{ eV} \cdot \text{s}$ $\hbar = h/2\pi = 1.05 \times 10^{-34}\text{ J} \cdot \text{s} = 6.58 \times 10^{-16}\text{ eV} \cdot \text{s}$
Rydberg constant:	$R = m_ek^2e^4/(4\pi c\hbar^3) = 1.10 \times 10^{-2}\text{ nm}^{-1}$
Rydberg energy:	$E_R = hcR = m_ek^2e^4/(2\hbar^2) = 13.6\text{ eV}$
Speed of light:	$c = 3.00 \times 10^8\text{ m/s}$

Useful Combinations

$hc = 1240\text{ eV} \cdot \text{nm} = 1240\text{ MeV} \cdot \text{fm}$

$\hbar c = 197\text{ eV} \cdot \text{nm} = 197\text{ MeV} \cdot \text{fm}$

$ke^2 = 1.44\text{ eV} \cdot \text{nm} = 1.44\text{ MeV} \cdot \text{fm}$

$N_A \times (1\text{ u}) = 1\text{ gram}$

$k_BT = 0.0252\text{ eV at room temperature (293 K)}$

Conversion Factors

Area:	$1\text{ barn} = 10^{-28}\text{ m}^2$
Energy:	$1\text{ cal} = 4.184\text{ J}$ $1\text{ eV} = 1.60 \times 10^{-19}\text{ J}$
Length:	$1\text{ Å} = 1\text{ angstrom} = 10^{-10}\text{ m}$ $1\text{ ft} = 30.48\text{ cm}$ $1\text{ in} = 2.54\text{ cm}$ $1\text{ mi} = 1609\text{ m}$
Mass:	$1\text{ lb(mass)} = 0.454\text{ kg}$ $1\text{ MeV}/c^2 = 1.074 \times 10^{-3}\text{ u} = 1.783 \times 10^{-30}\text{ kg}$ $1\text{ u} = \frac{1}{12}\text{m}(^{12}\text{C atom}) = 931.5\text{ MeV}/c^2 = 1.66 \times 10^{-27}\text{ kg}$
Momentum:	$1\text{ MeV}/c = 5.34 \times 10^{-22}\text{ kg} \cdot \text{m/s}$

[1] Taylor, Zafiratos, & Dubson, *Modern Physics for Scientists and Engineers*, 2nd Editon, Pearson, Prentice Hall, 2004