

PHYSICAL CONSTANTS (SI)⁷

Physical Quantity	Symbol	Value	Units
Boltzmann constant	k	1.3807×10^{-23}	J K^{-1}
Elementary charge	e	1.6022×10^{-19}	C
Electron mass	m_e	9.1094×10^{-31}	kg
Proton mass	m_p	1.6726×10^{-27}	kg
Gravitational constant	G	6.6726×10^{-11}	$\text{m}^3 \text{s}^{-2} \text{kg}^{-1}$
Planck constant	h	6.6261×10^{-34}	J s
	$\hbar = h/2\pi$	1.0546×10^{-34}	J s
Speed of light in vacuum	c	2.9979×10^8	m s^{-1}
Permittivity of free space	ϵ_0	8.8542×10^{-12}	F m^{-1}
Permeability of free space	μ_0	$4\pi \times 10^{-7}$	H m^{-1}
Proton/electron mass ratio	m_p/m_e	1.8362×10^3	
Electron charge/mass ratio	e/m_e	1.7588×10^{11}	C kg^{-1}
Rydberg constant	$R_\infty = \frac{me^4}{8\epsilon_0^2 ch^3}$	1.0974×10^7	m^{-1}
Bohr radius	$a_0 = \epsilon_0 h^2 / \pi m e^2$	5.2918×10^{-11}	m
Atomic cross section	πa_0^2	8.7974×10^{-21}	m^2
Classical electron radius	$r_e = e^2 / 4\pi\epsilon_0 m c^2$	2.8179×10^{-15}	m
Thomson cross section	$(8\pi/3)r_e^2$	6.6525×10^{-29}	m^2
Compton wavelength of electron	$h/m_e c$	2.4263×10^{-12}	m
	$\hbar/m_e c$	3.8616×10^{-13}	m
Fine-structure constant	$\alpha = e^2 / 2\epsilon_0 h c$	7.2974×10^{-3}	
	α^{-1}	137.04	
First radiation constant	$c_1 = 2\pi h c^2$	3.7418×10^{-16}	W m^2
Second radiation constant	$c_2 = hc/k$	1.4388×10^{-2}	m K
Stefan-Boltzmann constant	σ	5.6705×10^{-8}	$\text{W m}^{-2} \text{K}^{-4}$

Physical Quantity	Symbol	Value	Units
Wavelength associated with 1 eV	$\lambda_0 = hc/e$	1.2398×10^{-6}	m
Frequency associated with 1 eV	$\nu_0 = e/h$	2.4180×10^{14}	Hz
Wave number associated with 1 eV	$k_0 = e/hc$	8.0655×10^5	m^{-1}
Energy associated with 1 eV	$h\nu_0$	1.6022×10^{-19}	J
Energy associated with 1 m^{-1}	hc	1.9864×10^{-25}	J
Energy associated with 1 Rydberg	$me^3/8\epsilon_0^2h^2$	13.606	eV
Energy associated with 1 Kelvin	k/e	8.6174×10^{-5}	eV
Temperature associated with 1 eV	e/k	1.1604×10^4	K
Avogadro number	N_A	6.0221×10^{23}	mol^{-1}
Faraday constant	$F = N_A e$	9.6485×10^4	C mol^{-1}
Gas constant	$R = N_A k$	8.3145	$\text{J K}^{-1} \text{mol}^{-1}$
Loschmidt's number (no. density at STP)	n_0	2.6868×10^{25}	m^{-3}
Atomic mass unit	m_u	1.6605×10^{-27}	kg
Standard temperature	T_0	273.15	K
Atmospheric pressure	$p_0 = n_0 k T_0$	1.0133×10^5	Pa
Pressure of 1 mm Hg (1 torr)		1.3332×10^2	Pa
Molar volume at STP	$V_0 = RT_0/p_0$	2.2414×10^{-2}	m^3
Molar weight of air	M_{air}	2.8971×10^{-2}	kg
calorie (cal)		4.1868	J
Gravitational acceleration	g	9.8067	m s^{-2}