Learning Enhancement Team

University of East Anglia
STUDENT SUPPORT SERVICE

Factsheet: Physical Constants

Introduction

The importance of the physical constants that govern our universe cannot be understated. The following tables list universal, electromagnetic, atomic and nuclear and physico-chemical constants and their units to 3 decimal places.

Universal constants

Name	Symbol	Value (to 3 d.p.) and unit
Characteristic Impedance of Vacuum	$Z_0 = 1/\mu_0 c$	376.730 Ω
Permittivity of Free Space	$\varepsilon_0 = 1/\mu_0 c^2$	8.854×10^{-12} F m^{-1}
Permeability of Free space	μ_0	1.257×10^{-6} N A^{-2}
Newton's Gravitational Constant	G	$6.674 \times 10^{-11} m^3 \cdot kg^{-1} \cdot s^{-2}$
Planck's Constant	h	6.626×10^{-34} J·s
Dirac's Constant	$\hbar = h/2\pi$	1.055×10^{-34} J·s
Speed of Light in a Vacuum	c	2.998×10^{8} m·s^{-1}

Atomic and nuclear constants

Name	Symbol	Value (to 3 d.p.) and unit
Alpha Particle Mass	m_α	6.645×10^{-27} kg
Bohr Radius	a_0	0.529×10^{-10} m
Classical Electron Radius	r_e	2.818×10^{-15} m
Compton Wavelength	λ_c	2.426×10^{-12} m
Electron Mass	m_e	9.109×10^{-31} kg
Fine Structure Constant	α	7.297×10^{-3}
Neutron Mass	m_n	1.675×10^{-27} kg
Proton Mass	m_p	1.673×10^{-27} kg
Rydberg Constant	R_∞	10 973 731.569 m^{-1}

Electromagnetic constants

Name	Symbol	Value (to 3 d.p.) and unit
Bohr Magneton	μ_B	927.401×10^{-26} J T^{-1}
Conductance Quantum	G_0	7.748×10^{-5} S
Elementary Charge	e	1.602×10^{-19} C
Josephson Constant	K_J	$483\,597.879 \times 10^{9}$ Hz V^{-1}
Magnetic Flux Constant	Φ_0	2.068×10^{-15} Wb
Nuclear Magneton	μ_N	5.051×10^{-27} J T^{-1}
von Kiltzing Constant	R_K	25 812.807 Ω

Physico-chemical constants

Name	Symbol	Value (to 3 d.p.) and unit
Atomic Mass Constant	m_u	1.661×10^{-27} kg
Avogadro Constant	N_A or L	6.022×10^{23} mol^{-1}
Boltzmann Constant	k	1.381×10^{-23} J K^{-1}
Faraday Constant	F	96 485.338 C mol^{-1}
Molar Gas Constant	R	8.314 J mol^{-1} K^{-1}
Molar Volume of Ideal Gas (273.15 K, 101.325 kPa)	V_m	22.414×10^{-3} m^3 mol^{-1}

Want to know more?

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