

PHYSICS & ASTRONOMY DATA CARD

NOT TO BE REMOVED FROM THE EXAMINATION ROOM

Physical Constants

Gravitational constant	G	$6.673 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
Standard acceleration of gravity	g	9.807 m s^{-2}
Speed of light in vacuum	c	$2.998 \times 10^8 \text{ m s}^{-1}$
Permeability of vacuum	μ_0	$4\pi \times 10^{-7} \text{ H m}^{-1}$
Permittivity of vacuum	$\epsilon_0 = 1/\mu_0 c^2$ $(4\pi\epsilon_0)^{-1}$	$8.854 \times 10^{-12} \text{ F m}^{-1}$ $8.988 \times 10^9 \text{ N m}^2 \text{ C}^{-2}$
Elementary charge (electron charge = -e)	e	$1.602 \times 10^{-19} \text{ C}$
Electron mass	m_e	$9.109 \times 10^{-31} \text{ kg}$
Electron charge-to-mass ratio	e/m_e	$1.759 \times 10^{11} \text{ C kg}^{-1}$
Proton mass	m_p	$1.673 \times 10^{-27} \text{ kg}$
Neutron mass	m_n	$1.675 \times 10^{-27} \text{ kg}$
Planck's constant	h	$6.626 \times 10^{-34} \text{ J s}$
	$\hbar = h/2\pi$	$1.055 \times 10^{-34} \text{ J s}$
Avogadro's constant	N_A	$6.022 \times 10^{23} \text{ mol}^{-1}$
Boltzmann's constant	k	$1.381 \times 10^{-23} \text{ J K}^{-1}$
Molar gas constant	$R = N_A k$	$8.314 \text{ J K}^{-1} \text{ mol}^{-1}$
Rydberg constant	R_∞	$1.097 \times 10^7 \text{ m}^{-1}$
Bohr radius	a_0	$5.292 \times 10^{-11} \text{ m}$
Bohr magneton	$\mu_B = e\hbar/2m_e$	$9.274 \times 10^{-24} \text{ J T}^{-1}$
Nuclear magneton	$\mu_N = e\hbar/2m_p$	$5.051 \times 10^{-27} \text{ J T}^{-1}$
Stefan-Boltzmann constant	σ	$5.670 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$
Wien's constant	$b = \lambda_{\text{max}} T$	$2.898 \times 10^{-3} \text{ m K}$
Fine structure constant	$\alpha = e^2/4\pi\epsilon_0\hbar c$ α^{-1}	7.297×10^{-3} 137.04

Astronomical constants

Solar mass	M_\odot	$1.989 \times 10^{30} \text{ kg}$
Solar radius	R_\odot	$6.960 \times 10^5 \text{ km}$
Solar luminosity	L_\odot	$3.90 \times 10^{26} \text{ W}$
Astronomical Unit	AU	$1.496 \times 10^{11} \text{ m}$
Light year	LY	$9.460 \times 10^{15} \text{ m}$
Parsec	pc	$206265 \text{ AU} = 3.262 \text{ LY}$ $= 3.086 \times 10^{16} \text{ m}$

Conversion factors and definitions

kT at room temperature	=	0.0258 eV
Electron volt	1eV =	$1.602 \times 10^{-19} \text{ J}$
Rydberg energy	1 Ry =	13.6 eV
Angstrom	1Å =	10^{-10} m
Micron	1μ =	10^{-6} m
Atomic mass unit, $u = m(^{12}\text{C})/12$	1u =	$931.5 \text{ MeV}/c^2$
Standard atmosphere	1atm =	$1.013 \times 10^5 \text{ Pa}$
Bar	1bar =	10^5 Pa

Prefixes

Factor	10^{12}	10^9	10^6	10^3	10^{-3}	10^{-6}	10^{-9}	10^{-12}	10^{-15}	10^{-18}
Prefix	tera	giga	mega	kilo	milli	micro	nano	pico	femto	atto
Symbol	T	G	M	k	m	μ	n	p	f	a