

## SCHOOL OF PHYSICS & ASTRONOMY

### PHYSICAL CONSTANTS

*Candidates are advised that they should only use the number of significant figures appropriate for the problem they are attempting to solve.*

#### GENERAL CONSTANTS:

Charge on electron	$-e$	$= -1.60217733 \times 10^{-19} \text{ C}$
Mass of electron	$m_e$	$= 9.1093897 \times 10^{-31} \text{ kg}$ ( $\equiv 0.510998902 \text{ Mev}/c^2$ )
Mass of proton	$m_p$	$= 1.6726231 \times 10^{-27} \text{ kg}$ ( $\equiv 938.27200 \text{ Mev}/c^2$ )
Mass of neutron	$m_n$	$= 1.6749286 \times 10^{-27} \text{ kg}$ ( $\equiv 939.56533 \text{ Mev}/c^2$ )
Permeability of vacuum	$\mu_0$	$= 4\pi \times 10^{-7} \text{ H m}^{-1}$
Permittivity of vacuum	$\epsilon_0$	$= 8.854187817 \times 10^{-12} \text{ F m}^{-1}$
Fine structure constant	$\alpha$	$= 1/137.035989$
Gravitation constant	$G$	$= 6.67259 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$
Boltzmann's constant	$k_B$	$= 1.3806503 \times 10^{-23} \text{ J K}^{-1}$
Atmospheric pressure	1 atm.	$= 1.01325 \times 10^5 \text{ N m}^{-2}$ (Pa)
Stefan-Boltzmann constant	$\sigma$	$= 5.6704 \times 10^{-8} \text{ W m}^{-2} \text{ K}^{-4}$
Avogadro's number	$N$	$= 6.0221367 \times 10^{23}$
Velocity of light	$c$	$= 2.99792458 \times 10^8 \text{ m s}^{-1}$
Bohr radius	$a_0$	$= 5.2917721 \times 10^{-11} \text{ m}$
Bohr magneton	$\mu_B$	$= 9.274006 \times 10^{-24} \text{ J T}^{-1}$
Planck's constant	$h$	$= 6.62607544 \times 10^{-34} \text{ J s}$
Planck's constant/ $2\pi$	$\hbar$	$= 1.05457266 \times 10^{-34} \text{ J s}$

#### ASTRONOMICAL CONSTANTS

Astronomical unit:	1AU	$= 1.49597871 \times 10^{11} \text{ m}$
Parsec:	1pc	$= 3.08567758 \times 10^{16} \text{ m}$
Mass of the Earth	$M_\oplus$	$= 5.97 \times 10^{24} \text{ kg}$
Radius of the Earth	$R_\oplus$	$= 6.37814 \times 10^6 \text{ m}$
Mass of the Sun	$M_\odot$	$= 1.99 \times 10^{30} \text{ kg}$
Radius of the Sun	$R_\odot$	$= 6.96 \times 10^8 \text{ m}$
Luminosity of the Sun	$L_\odot$	$= 3.85 \times 10^{26} \text{ W}$
Thomson cross-section	$\sigma_T$	$= 6.652459 \times 10^{-29} \text{ m}^2$

#### ATOMIC AND NUCLEAR PHYSICS UNITS

	1 fm	$= 10^{-15} \text{ m}$
	1 barn	$= 10^{-28} \text{ m}^2$
Atomic mass unit	1 u.	$= 1.6605402 \times 10^{-27} \text{ kg}$
Atomic energy unit	1 a.u.	$= 27.2113834 \text{ eV}$
Ångstrom	1 Å	$= 10^{-10} \text{ m}$
Electron volt	1 eV	$= 1.6021765 \times 10^{-19} \text{ J}$
	$\hbar c$	$= 197.32696 \text{ MeV fm}$

(Updated 4 June 2010)