APPENDIX 5

"He who adds not to his learning diminishes it".
Jewish Talmud (3rd Century A.D.)

The physical constants constitute a body knowledge garnered over the years for the purpose of describing the physical world. These constants are being constantly corrected or added to through experiments and observations. Some physical constants are given in the Table below:

SOME PHYSICAL CONSTANTS

QUANTITY	SYMBOL	DIMENSION*	VALUE#
Charge of the electron	-e	Q	1.602×10^{-19} C
Mass of the electron	m.	$L^{-2}T^2QV$	9.110×10^{-31} kg
Charge of the proton	+e	Q	1.602×10^{-19} C
Mass of the proton	m_p	$L^{-2}T^2QV$	1.673×10^{-27} kg
Mass of the neutron	m_n	$L^{-2}T^2QV$	1.750×10^{-27} kg
Mass of the hydrogen atom	m_h	$L^{-2}T^2QV$	1.673×10^{-27} kg
Radius of the electron	r_e	L	2.817×10^{-15} m
Permittivity of vacuum	ε_o	$L^{-1}QV^{-1}$	8.854×10^{-12} F/m
Permeability of vacuum	μ_o	$L^{-1}T^2Q^{-1}V$	$4\pi \times 10^{-7}$ H/m
Speed of light in space	c	LT^{-1}	2.998×10^8 m/s
Refractive index of water	μ.	1	1.333 (at 300 K)
Planck constant	h.	TQV	6.626×10^{-34} J-s
Rydberg constant, R (Limit of Lyman series)	R $\nu_1 = 1/\lambda_1$	L^{-1}	1.097×10^7 /m (3.291×10^{15} Hz)
First bipolar (Bohr) radius	r_1	L	5.292×10^{-7} m
Speed of revolution in the first bipolar orbit	v_1	LT^{-1}	1.094×10^6 m/s
Angular momentum in the first bipolar orbit	$L = \frac{h}{4\pi}$	TQV	5.272×10^{-34} J-s
Frequency of revolution in the first bipolar orbit (Limit of Lyman series, cR)	f_1	T^{-1}	3.291×10^{15} Hz (Ultra-violet)
Wavelength of limit of Lyman series, 1/R	λ_1	L	9.116×10^{-8} m (Ultra-violet)
Wavelength of first line of		L	1.215×10^{-7} m

Lyman series, 4/3R			(Ultraviolet)
Wavelength of limit of Balmer series, 4/R	H_∞	L	3.646×10^{-7} m (Near ultra-violet)
Wavelength of fourth line of Balmer series, 9/2R	H_δ	L	4.102×10^{-7} m (Near ultra-violet)
Wavelength of third line of Balmer series, 100/21R	H_γ	L	4.341×10^{-7} m (Violet, visible)
Wavelength of second line of Balmer series, 16/3R	H_β	L	4.862×10^{-7} m (Blue-green, visible)
Wavelength of fist line of Balmer series, 36/5R	H_α	L	6.563×10^{-7} m (Red, visible)
Surface electrostatic field of the electron	σ_e	$L^{-1}V$	1.817×10^{20} V/m
Electrostatic potential of the electron	V_e	V	5.118×10^5 V
Intrinsic energy of the electron	$e_i = 0.5mc^2$	QV	4.100×10^{-14} J ≈ 0.25 MeV
Electron kinetic energy at the speed of light c.	$e_k = 0.5mc^2$	QV	4.100×10^{-14} J ≈ 0.25 MeV
Gravitational constant	G	$L^5T^{-4}Q^{-1}V^{-1}$	6.673×10^{-11} $Nm^2/(kg)^2$
Gravitational field	Γ	LT^{-2}	Nm/(kg)
Acceleration due to gravity	g.	LT^{-2}	9.807 m/s^2
Faraday constant	F	$L^2T^{-2}V^{-1}$	9.652×10^4 C6.025 $\times 10^{23}$ C/mole
Avogadro's number	N_o	1	6.025×10^{23} /mol
Volume of 1 mol at STP	V_o	L^3	22.421×10^{-3} m^3 per mole
Average radius of the Earth's orbit. Astronomical Unit (AU)	O_e	L	1.496×10^{11} m = 1 AU 8.311 light minutes
Average radius of the Moon's orbit	O_m	L	3.84×10^8 m 1.28 light seconds
Approx. distance between Sun and nearest Star (Proxima Centauri)	S_s	L	4.2 light years (LY) = 2.71×10^4 AU. I LY ≈ 9.46×10^{15} m
Closest distance to the nearest planet (Venus)	V_e	L	4.1×10^{10} m 0.274 AU

Radius of the Sun	R_s	L	6.96×10^8 m
Average radius of the Earth	R_e	L	$6..378 \times 10^6$ m
Average radius of the Moon	R_m	L	1.737×10^6 m
Mass of the Sun	M_s	$L^{-2}T^2QV$	1.99×10^{30} kg
Mass of the Earth	M_e	$L^{-2}T^2QV$	5.97×10^{24} kg
Mass of the Moon	M_m	$L^{-2}T^2QV$	7.35×10^{22} kg
Speed of rotation of the Earth at the equator	E_r	LT^{-1}	1.670×10^6 m/h 4.639×10^2 m/s
Speed of rotation of the Moon at the equator	M_r	LT^{-1}	3.680×10^6 m/h 4.592 m/s
Period of rotation of the Earth	D_e	T	24 hr = 9.64×10^4 s (Mean solar day)
Period of rotation of Moon	D_m	T	27.32 days
Average speed of orbital revolution of the Earth	S_e	LT^{-1}	1.075×10^8 m/h 2.986×10^4 m/s
Average speed of orbital revolution of the Moon	S_m	LT^{-1}	3.70×10^6 m/h 1.03×10^3 m/s
Period of revolution (orbital period) of the Earth	Y_e	T	1 solar year ≈ 365.26 days
Period of revolution (orbital period\) of the Moon	Y_m	T	27.32 days
Lunar month (Period between same phases)	L_m	T	29.53 days
Radiation (heat/light) power generated by the Sun	W_s	$T^{-1}QV$	3.38×10^{26} W (At about 5500° C)
Solar constant (Intensity at outer edge of atmosphere)	C_s	$L^{-2}\ T^{-1}QV$	1.4 kW/m^2
Constant of aberration	α.	1	20.47 arc sec.
Solar parallax	π_s	1	8.8 arc sec.
Sound speed in air at STP	v_s	LT^{-1}	3.34×10^2 m/s
Standard pressure	P_s	$L^{-3}QV$	≈ 10^5 newton/m^2
Standard temperature	T_s	-	0° C (273.16 K)
Escape velocity (neglecting air friction)	v_e	LT^{-1}	1.12×10^4 m/s

*The Fundamental Quantities are Length *[L]*, Time *[T]*, Electric Charge *[Q]* and Voltage *[V]*.

#Source: Encarta Encyclopaedia