

APPENDIX A

Constants and Measures

Constants and measures

Boltzmann constant	k	$1.383230 \times 10^{-23} \text{ JK}^{-1}$
Compton wavelength	λ_c	$2.4263105822 \times 10^{-12} \text{ m}$
Cosmic acceleration	a_0	$7.622470 \times 10^{-12} \text{ ms}^{-2}$
Distance Sun-Earth	AU	$1.495979 \times 10^{11} \text{ m}$
Earth mass	M_{earth}	$5.976 \times 10^{24} \text{ kg}$
Earth radius	R_{earth}	$6.37103 \times 10^6 \text{ m}$
Eddington's magic number	N	1.7507×10^{85}
Electron charge	q_e	$1.60217607 \times 10^{-19} \text{ C}$
Electron classical radius	r_e	$2.8179409238 \times 10^{-15} \text{ m}$
Electron mass	m_e	$9.109389754 \times 10^{-31} \text{ kg}$
Electron rest mass energy	E_0	$8.187111216 \times 10^{-14} \text{ J}$
Electron-proton mass ratio	m_e / m_p	$5.4461701311 \times 10^{-4}$
Elementary charge	q	$1.60217607 \times 10^{-19} \text{ C}$
Fine-structure constant	α	$7.29735308 \times 10^{-3}$
Frequency of Universe	ν_0	$4.046645 \times 10^{-21} \text{ Hz}$
Frequency of Universe	ω_0	$2.542582 \times 10^{-20} \text{ rad / s}$
Gravitational constant	G	$6.6445 \times 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$
Hubble's time (period)	t_0	$2.47118 \times 10^{20} \text{ s}$
Lightyear	ly	$9.460530 \times 10^{15} \text{ m}$
Mass density of Universe	ρ	$2.32273 \times 10^{-30} \text{ kg}$
Microwave Background Temperature	T	$2.766^\circ \text{ Kelvin}$
Parsec	pc	$3.085678 \times 10^{16} \text{ m}$
Permeability of vacuum	μ_0	$1.2566370614 \times 10^{-6} \text{ NA}^{-2}$
Permittivity of vacuum	ϵ_0	$8.854187817 \times 10^{-12} \text{ Fm}^{-1}$
Planck's constant	h	$6.62607554 \times 10^{-34} \text{ Js}$
Proton mass	m_p	$1.6726231 \times 10^{-27} \text{ kg}$
Solar mass	M_{sun}	$1.989 \times 10^{30} \text{ kg}$
Solar radius	R_{sun}	$6.9599 \times 10^8 \text{ m}$
Speed of light in vacuum	c	$2.99792458 \times 10^8 \text{ ms}^{-1}$
Stephan-Boltzmann constant (area)	σ	$5.6705119 \times 10^{-8} \text{ Wm}^{-2} \text{ K}^{-4}$
Stephan-Boltzmann constant (volume)	a	$3.565 \times 10^{-15} \text{ J m}^{-3} \text{ K}^{-4}$
Time universal constant	s	$1.11265 \times 10^{-17} \text{ s}^3 \text{ m}^{-2}$
Universe (distance to center)	R_{univ}	$1.17908 \times 10^{28} \text{ m}$
Universe (mass within R_{univ})	M_{univ}	$1.59486 \times 10^{55} \text{ kg}$
Year	y	$3.155692597 \times 10^7 \text{ s}$

Absolute velocity	$v = A\omega_0 \sin \alpha$	
Acceleration	$a = x\omega_0^2$	
Distance from center of mass	$x = a / \omega_0^2 = A \cos \alpha$	
Force constant	$k = \omega_0^2 M$	
Absolute potential energy of matter	$E = E_0 / (\sqrt{2} \sin \alpha)$	$(0^\circ - 45^\circ)$
	$E = E_0 \sqrt{2} \cos \alpha$	$(45^\circ - 90^\circ)$
Maximum amplitude	$A = 1.667 \times 10^{28} \text{ m}$	
Our distance to center of mass	$x_0 = 1.179 \times 10^{28} \text{ m}$	
Angular frequency of Universe	$\omega_0 = 2.543 \times 10^{-20} \text{ rad/s}$	