

Physics 310 – Cosmology
Units and Constants

Fundamental SI Units

<u>Measures</u>	<u>Name</u>	<u>Abbr.</u>
Length	meter	m
Time	second	s
Mass	kilogram	kg
Temperature	Kelvin	K
Charge	Coulomb	C

Metric Abbreviations

<u>Name</u>	<u>Abbr.</u>	<u>Multiple</u>
tera	T	10^{12}
giga	G	10^9
mega	M	10^6
kilo	k	10^3
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}
femto	f	10^{-15}

Derived SI Units

<u>Measures</u>	<u>Name</u>	<u>Abbr.</u>	<u>Equiv.</u>
Force	Newton	N	$\text{kg}\cdot\text{m}/\text{s}^2$
Energy	Joule	J	N·m
Power	Watt	W	J/s
Frequency	Hertz	Hz	s^{-1}
Pressure	Pascal	Pa	N/m^2
Elec. Potential	Volt	V	J/C
Mag. Field	Tesla	T	$\text{N}\cdot\text{s}/\text{m}/\text{C}$

Non SI Units

<u>Name</u>	<u>Abbr.</u>	<u>Value</u>
Minute	min	60 s
Hour	h	3600 s
Day	d	86,400 s
Year	y	3.156×10^7 s
Angstrom	Å	10^{-10} m
Astronomical Unit	AU	1.496×10^{11} m
Parsec	pc	3.086×10^{16} m
Electron volt	eV	1.602×10^{-19} J

Physical Constants

<u>Name</u>	<u>Symbol</u>	<u>Value</u>
Speed of light	c	2.9979×10^8 m/s
Planck's Reduced Constant	\hbar	1.0546×10^{-34} J·s $= 6.5821\times 10^{-16}$ eV·s
Boltzmann's Constant	k_B	1.3807×10^{-23} J/K $= 8.6173\times 10^{-5}$ eV/K
Newton's Constant	G	6.674×10^{-11} $\text{m}^3/\text{kg}/\text{s}^2$
Fundamental Charge	e	1.6022×10^{-19} C
Avogadro's number	N_A	6.0221×10^{23} /mol
Electron mass	m_e	9.1094×10^{-31} kg $= 511.00$ keV/ c^2
Proton mass	m_p	1.6726×10^{-27} kg $= 938.27$ MeV/ c^2
Neutron mass	m_n	1.6749×10^{-27} kg $= 939.56$ MeV/ c^2
Coulomb's Constant	k_e	8.9876×10^9 $\text{N}\cdot\text{m}^2/\text{C}^2$

Useful Combinations

<u>Combination</u>	<u>Value</u>
$\hbar c$	3.1615×10^{-26} J·m $= 197.33$ eV·nm
$\alpha \equiv \frac{k_e e^2}{\hbar c}$	$0.0072974 = \frac{1}{137.04}$
$\sigma \equiv \frac{\pi^2 k_B^4}{60 \hbar^3 c^2}$	5.670×10^{-8} $\text{W}/\text{m}^2/\text{K}^4$
MeV/c	5.344×10^{-22} kg·m/s
MeV/ c^2	1.78266×10^{-30} kg

Angles

1 circle = $360^\circ = 2\pi$ rad
 $1^\circ = 60$ arc-min = $60'$
 $1' = 60$ arc-sec = $60''$
 $1'' = 1000$ milli-arc-sec = 1000 mas

<u>Name</u>	<u>Abbr.</u>	<u>Value</u>
Solar Radius	R_\odot	6.955×10^8 m
Solar Mass	M_\odot	1.989×10^{30} kg
Solar Lum.	L_\odot	3.839×10^{26} W
Solar Temp.	T_\odot	5777 K