

1 Natural Units

Cosmologists and particle physicists like to suppress units by setting the fundamental constants c , \hbar , k_B to unity so that there is one fundamental unit. Structure formation cosmologists generally prefer Mpc as a unit of length, time, inverse energy, inverse temperature. Early universe people use GeV. Familiarize yourself with the elimination and restoration of units in the cosmological context. Occasionally you will also see the reduced Planck mass $M_{\text{pl}} = (8\pi G)^{-1/2}$ set to unity as well where even that last dimension is set to unity.

Here are some fundamental constants of nature

Planck's constant	$\hbar = 1.0546 \times 10^{-27} \text{ cm}^2 \text{ g s}^{-1}$
Speed of light	$c = 2.9979 \times 10^{10} \text{ cm s}^{-1}$
Boltzmann's constant	$k_B = 1.3807 \times 10^{-16} \text{ erg K}^{-1}$
Fine structure constant	$\alpha = 1/137.036$
Gravitational constant	$G = 6.6720 \times 10^{-8} \text{ cm}^3 \text{ g}^{-1} \text{ s}^{-2}$
Stefan-Boltzmann constant	$\sigma = a/4 = \pi^2/60$ $a = 7.5646 \times 10^{-15} \text{ erg cm}^{-3} \text{ K}^{-4}$
Thomson cross section	$\sigma_T = 8\pi\alpha^2/3m_e^2 = 6.6524 \times 10^{-25} \text{ cm}^2$
Electron mass	$m_e = 0.5110 \text{ MeV}$
Neutron mass	$m_n = 939.566 \text{ MeV}$
Proton mass	$m_p = 938.272 \text{ MeV}$
Planck mass	$m_{\text{pl}} = G^{-1/2} = 1.221 \times 10^{19} \text{ GeV}$
Reduced Planck mass	$M_{\text{pl}} = (8\pi G)^{-1/2} = 2.435 \times 10^{18} \text{ GeV}$

and here are some unit conversions:

1 s	$= 9.7157 \times 10^{-15} \text{ Mpc}$
1 yr	$= 3.1558 \times 10^7 \text{ s}$
1 Mpc	$= 3.0856 \times 10^{24} \text{ cm}$
1 AU	$= 1.4960 \times 10^{13} \text{ cm}$
1 K	$= 8.6170 \times 10^{-5} \text{ eV}$
1 M_\odot	$= 1.989 \times 10^{33} \text{ g}$
1 GeV	$= 1.6022 \times 10^{-3} \text{ erg}$
	$= 1.7827 \times 10^{-24} \text{ g}$
	$= (1.9733 \times 10^{-14} \text{ cm})^{-1}$
	$= (6.5821 \times 10^{-25} \text{ s})^{-1}$