

Constants

Elementary charge $e = 1.6022 \cdot 10^{-19} \text{ C}$
 $e^2/(4\pi\epsilon_0) = 2.3071 \cdot 10^{-28} \text{ J m} = 1.440 \cdot 10^{-9} \text{ eV m} = 1.440 \text{ MeV fm}$
 Planck constant $h = 6.6261 \cdot 10^{-34} \text{ J s} = 4.1357 \cdot 10^{-15} \text{ eV s}$
 Boltzmann constant $k_B = 1.38 \cdot 10^{-23} \text{ J/K} = 8.617 \cdot 10^{-5} \text{ eV/K}$
 Avogadro constant $N_A = 6.0221 \cdot 10^{23} \text{ molecules per g/mol}$
 Speed of light (in vacuum) $c = 2.99792 \cdot 10^8 \text{ m/s}$
 Permeability of free space $\mu_0 = 4\pi \cdot 10^{-7} \text{ N/A}^2 \approx 1.26 \cdot 10^{-6} \text{ N/A}^2$
 Permittivity of free space $\epsilon_0 = 1/\mu_0 c^2 \approx 8.85 \cdot 10^{-12} \text{ C}^2/\text{Nm}^2$
 Fine structure constant $\alpha = e^2/4\pi\epsilon_0\hbar c = 1/137.036$
 Strong coupling constant $\alpha_s (M_Z c) = 0.118$; $M_Z = 91.19 \text{ GeV}/c^2$
 Atomic mass unit $u = 1.660539 \cdot 10^{-27} \text{ kg} = 931.4940 \text{ MeV}/c^2$

Masses

electron $m_e = 9.11 \cdot 10^{-31} \text{ kg} = 0.511 \text{ MeV}/c^2 = 5.4858 \cdot 10^{-4} \text{ u}$
 proton $m_p = 1.6726 \cdot 10^{-27} \text{ kg} = 938.27 \text{ MeV}/c^2 = 1.00728 \text{ u}$
 neutron $m_n = 1.6749 \cdot 10^{-27} \text{ kg} = 939.57 \text{ MeV}/c^2 = 1.00866 \text{ u}$
 deuteron $m_d = 2.01355 \text{ u}$
 α particle $m_\alpha = 4.00151 \text{ u}$
 hydrogen atom $M(^1\text{H}) = 1.007825 \text{ u}$
 deuterium $M(^2\text{D}) = 2.014102 \text{ u}$
 helium atom $= M(^4\text{He}) = 4.002603 \text{ u}$

Other useful data

$hc = 1.9864 \cdot 10^{-25} \text{ J m} = 1240 \text{ MeV fm}$
 $hc = 3.1615 \cdot 10^{-26} \text{ J m} = 197.327 \text{ MeV fm}$
 $\hbar = 1.054 \cdot 10^{-34} \text{ J s} = 6.5821 \cdot 10^{-22} \text{ MeV s}$
 $1 \text{ eV} = 1.6022 \cdot 10^{-19} \text{ J}$
 $1 \text{ year} = 3.1536 \cdot 10^7 \text{ s}$
 $1 \text{ Ci} = 3.7 \cdot 10^{10} \text{ Bq}$
 Compton wavelength $= \lambda_C = h/(m_e c) = 2.4263 \cdot 10^{-12} \text{ m}$
 Bohr radius $a_0 = 4\pi\epsilon_0\hbar^2/(me^2) = 5.2918 \cdot 10^{-11} \text{ m} = 0.0529 \text{ nm}$
 Hydrogen ground state $= E_0 = e^2/(8\pi\epsilon_0 a_0) = -13.606 \text{ eV} = 2.1799 \cdot 10^{-18} \text{ J}$
 Bohr magneton $\mu_B = e\hbar/2m_e = 9.27 \cdot 10^{-24} \text{ J/T} = 5.788 \cdot 10^{-11} \text{ MeV/T}$
 Nuclear magneton $\mu_N = e\hbar/2m_p = 5.0508 \cdot 10^{-27} \text{ J/T} = 3.1524 \cdot 10^{-14} \text{ MeV/T}$
 Acceleration due to gravity on Earth's surface $g = 9.81 \text{ m s}^{-2}$
 $1 \text{ gram molecule at STP occupies } 22.4 \text{ litres}$
 $kT \text{ (at } RT = 293 \text{ K)} = 2.5249 \cdot 10^{-2} \text{ eV} = 1/40 \text{ eV}$

Phys 314 Constants and Useful Data

Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Period																		
1	1 H 1.008																	2 He 4.0026
2	3 Li 6.94	4 Be 9.0122											5 B 10.81	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
3	11 Na 22.990	12 Mg 24.305											13 Al 26.982	14 Si 28.085	15 P 30.974	16 S 32.06	17 Cl 35.45	18 Ar 39.948
4	19 K 39.098	20 Ca 40.078	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.38	31 Ga 69.723	32 Ge 72.63	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.798
5	37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.96	43 Tc [97.91]	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
6	55 Cs 132.91	56 Ba 137.33	* 71 Lu 174.97	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po [208.98]	85 At [209.99]	86 Rn [222.02]
7	87 Fr [223.02]	88 Ra [226.03]	** 103 Lr [262.11]	104 Rf [265.12]	105 Db [268.13]	106 Sg [271.13]	107 Bh [270]	108 Hs [277.15]	109 Mt [276.15]	110 Ds [281.16]	111 Rg [280.16]	112 Cn [285.17]	113 Uut [284.18]	114 Fl [289.19]	115 Uup [288.19]	116 Lv [293]	117 Uus [294]	118 Uuo [294]
*Lanthanoids			* 57 La 138.91	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm [144.91]	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.05		
**Actinoids			** 89 Ac [227.03]	90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np [237.05]	94 Pu [244.06]	95 Am [243.06]	96 Cm [247.07]	97 Bk [247.07]	98 Cf [251.08]	99 Es [252.08]	100 Fm [257.10]	101 Md [258.10]	102 No [259.10]		