| | Physical Constants | Conversion Factors |
|---|---|---|
| Bohr radius | $a_o = 5.29177249(24)\times10^{-11}$ m | $T_o = -273.15$ K |
| Vacuum speed of light | $c = 2.99792458\times10^{8}$ m $s^{-1}$ | 1 atm = $1.01325\times10^{5}$ Pa |
| Vacuum permittivity | $\varepsilon_o = 8.854187817\times10^{-12}$ $J^{-1}C^2m^{-1}$ | 1 bar = 0.98692 atm |
| Elementary charge | $e = 1.60217733(49)\times10^{-19}$ C | 1 bar = 750.062 torr |
| Faraday | $F = 9.6485309(29)\times10^{4}$ C $mol^{-1}$ | 1 cal = 4.184 J |
| Acceleration of gravity | g = 9.80665 m $s^{-2}$ | 1 eV = 96.485309 kJ $mol^{-1}$ |
| Planck constant | $h = 6.6260755(40)\times10^{-34}$ J s | 1 eV = 8065.5409(55) $cm^{-1}$ |
| | $\hbar = 1.05457266(63)\times10^{-34}$ J s | 1 $cm^{-1}$ = 11.962658(10) J $mol^{-1}$ |
| $cm^{-1} \rightarrow$ K | hc/k = 1.4387782(16) cm K | 1 H = 27.21138386(68) eV |
| Boltzmann constant | $k = 1.3806488(13)\times10^{-23}$ J $K^{-1}$ | 1 H = 2625.4974(16) kJ $mol^{-1}$ |
| Room T $\rightarrow$ $cm^{-1}$ | kT/hc = 207.22443(23) $cm^{-1}$ | 1 H = $4.35974394(22)\times10^{-18}$ J |
| Electron rest mass | $m_e = 9.1093897(54)\times10^{-31}$ kg | 1 H = 219474.6313705(15) $cm^{-1}$ |
| Neutron rest mass | $m_n = 1.6749286(10)\times10^{-27}$ kg | 1 H = 627.509469 kcal $mol^{-1}$ |
| Proton rest mass | $m_p = 1.6726231(10)\times10^{-27}$ kg | 1 kWh = $3.6\times10^{6}$ J |
| Bohr magneton | $\mu_B = 9.2740154(31)\times10^{-24}$ J $T^{-1}$ | 1 Å = $1\times10^{-10}$ m |
| Electron magnetic moment | $\mu_e = 9.2847701(31)\times10^{-24}$ J $T^{-1}$ | 1 in = 2.54 cm |
| Proton magnetic moment | $\mu_p = 1.41060761(47)\times10^{-26}$ J $T^{-1}$ | 1 mi = 1.609 km |
| Avogadro constant | $N_A = 6.0221367(36)\times10^{23}$ $mol^{-1}$ | 1 lb = 0.4536 kg |
| Gas constant | R = 8.3144621(75) J $K^{-1}$ $mol^{-1}$ | 1 oz = 28.35 g |
| | R = 0.083144621(75) L bar $K^{-1}$ $mol^{-1}$ | 1 qt = 0.9464 L |
| | R = 0.08205746(14) L atm $mol^{-1}$ $K^{-1}$ | 1 gal = $3.7854\times10^{-3}$ $m^3$ |
| Rydberg Constant | $\Re_H = 2.1798741\times10^{-18}$ J | $\pi = 3.14159265359$ |
| | $\Re_H = 109737.31534(13)$ $cm^{-1}$ | e = 2.7182818 |

*Notation: 1.2345(67) gives the uncertainty of 67 in the final two digits: 1.2345 ± 0.0067*

| T (K) | | 100.0 | 298.15 | 500.0 | 1000.0 | 1500.0 | 2000.0 |
|---|---|---|---|---|---|---|---|
| kT/hc | ($cm^{-1}$) | 69.50 | 207.224 | 347.5 | 695.0 | 1042.6 | 1390.1 |
| kT /e | (eV) | 0.008617 | 0.025693 | 0.04309 | 0.08617 | 0.12926 | 0.17235 |
| (kT/h) | ($s^{-1}$) | $2.0837_{x10^{12}}$ | $6.2124_{x10^{12}}$ | $1.0418_{x10^{13}}$ | $2.0837_{x10^{13}}$ | $3.1255_{x10^{13}}$ | $4.1673_{x10^{13}}$ |

**Isotopic Masses** (amu) [abundance]

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $^{1}$H 1.007825 [99.9885]<br>$^{2}$H 2.014102 [0.115] | | | | | | | $^{3}$He 3.016029 [0.000137]<br>$^{4}$He 4.002603 [99.999863] |
| $^{6}$Li 6.015122 [7.59]<br>$^{7}$Li 7.016004 [92.41] | $^{9}$Be 9.012182 [100] | $^{10}$B 10.012937 [19.9]<br>$^{11}$B 11.009305 [80.1] | $^{12}$C 12.000000 [98.93]<br>$^{13}$C 13.003355 [1.07]<br>$^{14}$C 14.003242 [*] | $^{14}$N 14.003074 [99.632]<br>$^{15}$N 15.000109 [0.368] | $^{16}$O 15.994915 [99.757]<br>$^{17}$O 16.999132 [0.038]<br>$^{18}$O 17.999161 [0.205] | $^{19}$F 18.998403 [100] | $^{20}$Ne 19.992440 [90.48]<br>$^{21}$Ne 20.993847 [0.27]<br>$^{22}$Ne 21.991386 [9.25] |
| $^{23}$Na 22.989770 [100] | $^{24}$Mg 23.985042 [78.99]<br>$^{25}$Mg 24.985837 [10.00]<br>$^{26}$Mg 25.982593 [11.01] | $^{27}$Al 26.981538 [100] | $^{28}$Si 27.976927 [92.2297]<br>$^{29}$Si 28.976495 [4.6832]<br>$^{30}$Si 29.973770 [3.0872] | $^{31}$P 30.973762 [100] | $^{32}$S 31.972071 [94.93]<br>$^{33}$S 32.971458 [0.76]<br>$^{34}$S 33.967867 [4.29]<br>$^{36}$S 35.967081 [0.02] | $^{35}$Cl 34.968853 [75.78]<br>$^{37}$Cl 36.965903 [24.22] | $^{36}$Ar 35.967546 [0.3365]<br>$^{38}$Ar 37.962732 [0.0632]<br>$^{40}$Ar 39.962383 [99.6003] |
| $^{39}$K 38.963707 [93.2581]<br>$^{40}$K 39.963999 [0.0117]<br>$^{41}$K 40.961826 [6.7302] | $^{40}$Ca 39.962591 [96.941]<br>$^{42}$Ca 41.958618 [0.647]<br>$^{43}$Ca 42.958767 [0.135]<br>$^{44}$Ca 43.955481 [2.086]<br>$^{46}$Ca 45.953693 [0.004]<br>$^{48}$Ca 47.952534 [0.187] | $^{69}$Ga 68.925581 [60.108]<br>$^{71}$Ga 70.924705 [39.892] | $^{70}$Ge 69.924250 [20.84]<br>$^{72}$Ge 71.922076 [27.54]<br>$^{73}$Ge 72.923459 [7.73]<br>$^{74}$Ge 73.921178 [36.28]<br>$^{76}$Ge 75.921403 [7.61] | $^{75}$As 74.921596 [100] | $^{74}$Se 73.922477 [0.89]<br>$^{76}$Se 75.919214 [9.37]<br>$^{77}$Se 76.919915 [7.63]<br>$^{78}$Se 77.917310 [23.77]<br>$^{80}$Se 79.916522 [49.61]<br>$^{82}$Se 81.916700 [8.73] | $^{79}$Br 78.918338 [50.69]<br>$^{81}$Br 80.916291 [49.31] | $^{78}$Kr 77.920386 [0.35]<br>$^{80}$Kr 79.916378 [2.28]<br>$^{82}$Kr 81.913485 [11.58]<br>$^{83}$Kr 82.914136 [11.49]<br>$^{84}$Kr 83.911507 [57.00]<br>$^{86}$Kr 85.910610 [17.30] |