

15.1: Appendix A- Definitions of the SI Base Units

The official definitions of the base units given in the IUPAC Green Book (E. Richard Cohen et al, *Quantities, Units and Symbols in Physical Chemistry*, 3rd edition, RSC Publishing, Cambridge, 2007, Sec. 3.3) are as follows.

- The **metre** is the length of path traveled by light in vacuum during a time interval of $1/299,792,458$ of a second.
[This e-book uses the alternative spelling *meter*.]
- The **kilogram** is the unit of mass; it is equal to the mass of the international prototype of the kilogram.
[The international prototype is a platinum-iridium cylinder stored in a vault of the International Bureau of Weights and Measures in Sèvres near Paris, France.]
- The **second** is the duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium 133 atom. This definition refers to a caesium atom at rest at a temperature of 0 K.
- The **kelvin**, unit of thermodynamic temperature, is the fraction $1/273.16$ of the thermodynamic temperature of the triple point of water. This definition refers to water having the isotopic composition defined exactly by the following amount-of-substance ratios: 0.000 155 76 mole of ^2H per mole of ^1H , 0.000 379 9 mole of ^{17}O per mole of ^{16}O , and 0.002 005 2 mole of ^{18}O per mole of ^{16}O .
- The **mole** is the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon 12; its symbol is “mol”. When the mole is used, the elementary entities must be specified and may be atoms, molecules, ions, electrons, other particles, or specified groups of such particles. In this definition, it is understood that unbound atoms of carbon 12, at rest and in their ground state, are referred to.
- The **ampere** is that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross-section, and placed 1 metre apart in vacuum, would produce between these conductors a force equal to 2×10^{-7} newton per metre of length.
- The **candela** is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540×10^{12} hertz and that has a radiant intensity in that direction of $1/683$ watt per steradian.

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