

Definitions of Base Units of the International System of Units (SI) and Derived Unit of Temperature

1. The definitions of SI base units established at the 26th meeting of the General Conference on Weights and Measures (*Conférence générale des poids et mesures*) in 2018 are as follows:
 - 1) The unit of time, second, is defined by taking the fixed numerical value of the caesium frequency $\Delta\nu_{\text{Cs}}$, the unperturbed ground-state hyperfine transition frequency of the caesium 133 atom, to be 9 192 631 770 when expressed in the unit Hz, which is equal to s^{-1} ;
 - 2) The unit of length, metre, is defined by taking the fixed numerical value of the speed of light in vacuum c to be 299 792 458 when expressed in the unit m/s, where the second is defined in terms of $\Delta\nu_{\text{Cs}}$;
 - 3) The unit of mass, kilogram, is defined by taking the fixed numerical value of the Planck constant h to be $6,626\,070\,15 \times 10^{-34}$ when expressed in the unit J s, which is equal to $\text{kg m}^2 \text{s}^{-1}$, where the metre and the second are defined in terms of c and $\Delta\nu_{\text{Cs}}$;
 - 4) The unit of electric current, ampere, is defined by taking the fixed numerical value of the elementary charge e to be $1,602\,176\,634 \times 10^{-19}$ when expressed in the unit C, which is equal to A s, where the second is defined in terms of $\Delta\nu_{\text{Cs}}$;
 - 5) The unit of thermodynamic temperature, kelvin, is defined by taking the fixed numerical value of the Boltzmann constant k to be $1,380\,649 \times 10^{-23}$ when expressed in the unit J K^{-1} , which is equal to $\text{kg m}^2 \text{s}^{-2} \text{K}^{-1}$, where the kilogram, metre and second are defined in terms of h , c and $\Delta\nu_{\text{Cs}}$;
 - 6) The unit of amount of substance, mole, contains exactly $6,022\,140\,76 \times 10^{23}$ elementary entities. This number is the fixed numerical value of the Avogadro constant, N_{A} , when expressed in the unit mol^{-1} and is called the Avogadro number. The amount of substance (symbol n) of a system is a measure of the number of specified elementary entities. An elementary entity may be an atom, a molecule, an ion, an electron, any other particle or specified group of particles;
 - 7) The unit of luminous intensity in a given direction, candela, is defined by taking the fixed numerical value of the luminous efficacy of monochromatic radiation of frequency 540×10^{12} Hz, K_{cd} , to be 683 when expressed in the unit lm W^{-1} , which is equal to cd sr W^{-1} , or $\text{cd sr kg}^{-1} \text{m}^{-2} \text{s}^3$, where the kilogram, metre and second are defined in terms of h , c and $\Delta\nu_{\text{Cs}}$.
2. Celsius temperature, symbol t , can be derived from thermodynamic temperature, symbol T , which is defined as the difference $t = T - T_0$ between the two thermodynamic temperatures T and T_0 where $T_0 = 273,15$ K. The unit ‘degree Celsius’ is used for expressing Celsius temperature, equal to the unit ‘kelvin’. In such case the degree Celsius is a special name used instead of the kelvin. An interval or difference of temperature may be expressed either in kelvins or in degrees Celsius.