SI UNIT DEFINITIONS (D6)

Base Units

Base Unit	**Base Symbol**	**Base Quantity**	**Typical Symbol**	**Formal Definition**	**Equation**
Second	s	Time	t	The second, symbol s, is the SI unit of time. It is defined by taking the fixed numerical value of the caesium frequency, $\Delta\nu_{\mathrm{Cs}}$, 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}.	$1\ \mathrm{s} = \frac{9\,192\,631\,770}{\Delta\nu_{\mathrm{Cs}}}$
Metre	m	Length	$l, x, r,$ etc.	The metre, symbol m, is the SI unit of length. It 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 $\mathrm{m\ s^{-1}}$, where the second is defined in terms of the caesium frequency $\Delta\nu_{\mathrm{Cs}}$.	$1\ \mathrm{m} = \left(\frac{c}{299\,792\,458}\right)\mathrm{s}$
Kilogram	kg	Mass	m	The kilogram, symbol kg, is the SI unit of mass. It 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 $\mathrm{J\ s}$, which is equal to $\mathrm{kg\ m^2\ s^{-1}}$, where the metre and the second are defined in terms of c and $\Delta\nu_{\mathrm{Cs}}$.	$1\ \mathrm{kg} = \left(\frac{h}{6.626\,070\,15 \times 10^{-34}}\right)\mathrm{m^{-2}s}$
Ampere	A	Electric Current	I, i	The ampere, symbol A, is the SI unit of electric current. It 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 $\mathrm{A\ s}$, where the second is defined in terms of $\Delta\nu_{\mathrm{Cs}}$.	$1\ \mathrm{A} = \left(\frac{e}{1.602\,176\,634 \times 10^{-19}}\right)\mathrm{s^{-1}}$
Kelvin	K	Thermodynamic Temperature	T	The kelvin, symbol K, is the SI unit of thermodynamic temperature. It 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 $\mathrm{J\ K^{-1}}$, which is equal to $\mathrm{kg\ m^2\ s^{-2}}$	$1\ \mathrm{K} = \left(\frac{1.380\,649 \times 10^{-23}}{k}\right)\mathrm{kg\ m^2\ s^{-2}}$

Base Unit	Base Symbol	Base Quantity	Typical Symbol	Formal Definition	Equation
				K^{-1}, where the kilogram, metre and second are defined in terms of h, c and $\Delta\nu_{\mathrm{Cs}}$.	
Mole	mol	Amount of Substance	n	The mole, symbol mol, is the SI unit of amount of substance. One 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.	$1\ \mathrm{mol} = \left(\frac{6.022\ 140\ 76 \times 10^{23}}{N_{\mathrm{A}}}\right)$
Candela	cd	Luminous Intensity	I_{V}	The candela, symbol cd, is the SI unit of luminous intensity in a given direction. It is defined by taking the fixed numerical value of the luminous efficacy of monochromatic radiation of frequency $540 \times 10^{12}\ \mathrm{Hz}$, K_{cd}, to be 683 when expressed in the unit $\mathrm{lm\ W^{-1}}$, which is equal to $\mathrm{cd\ sr\ W^{-1}}$, or $\mathrm{cd\ sr\ kg^{-1}}$ $\mathrm{m^{-2}\ s^{3}}$, where the kilogram, metre and second are defined in terms of h, c and $\Delta\nu_{Cs}$.	$1\ \mathrm{cd} = \left(\frac{K_{\mathrm{cd}}}{683}\right) \mathrm{kg\ m^{2}\ s^{-3}\ sr^{-1}}$

Sources:

- Base Unit [1] [2]
- Base Symbol [1] [2]
- Base Quantity [1] [2]
- Typical Symbol [1] [2]
- Formal Definition [1] [2]
- Equation [1] [2]

Derived Units

Derived Unit	**Unit Symbol**	**Derived Quantity**	**Equation Expressed in Terms of SI Base Units**	**Equation Expressed in Terms of Other SI Units**
Radian	rad	Plane Angle	$\mathrm{rad = m/m}$	-
Steradian	sr	Solid Angle	$\mathrm{sr = m^2/m^2}$	-
Hertz	Hz	Frequency	$\mathrm{Hz = s^{-1}}$	-
Newton	N	Force	$\mathrm{N = kg\ m\ s^{-2}}$	-
Pascal	Pa	Pressure, Stress	$\mathrm{Pa = kg\ m^{-1}\ s^{-2}}$	-
Joule	J	Energy, Work, Amount of Heat	$\mathrm{J = kg\ m^2\ s^{-2}}$	$\mathrm{J = N\ m}$
Watt	W	Power, Radiant Flux	$\mathrm{W = kg\ m^2\ s^{-3}}$	$\mathrm{W = J/s}$
Coulomb	C	Electric Charge	$\mathrm{C = A\ s}$	-
Volt	V	Electric Potential Difference	$\mathrm{V = kg\ m^2\ s^{-3}\ A^{-1}}$	$\mathrm{V = W/A}$
Farad	F	Capacitance	$\mathrm{F = kg^{-1}\ m^{-2}\ s^4\ A^2}$	$\mathrm{F = C/V}$
Ohm	Ω	Electric Resistance	$\mathrm{\Omega = kg\ m^2\ s^{-3}\ A^{-2}}$	$\mathrm{\Omega = V/A}$
Siemens	S	Electric Conductance	$\mathrm{S = kg^{-1}\ m^{-2}\ s^3\ A^2}$	$\mathrm{S = A/V}$
Weber	Wb	Magnetic Flux	$\mathrm{Wb = kg\ m^2\ s^{-2}\ A^{-1}}$	$\mathrm{Wb = V\ s}$
Tesla	T	Magnetic Flux Density	$\mathrm{T = kg\ s^{-2}\ A^{-1}}$	$\mathrm{T = Wb/m^2}$
Henry	H	Inductance	$\mathrm{H = kg\ m^2\ s^{-2}\ A^{-2}}$	$\mathrm{H = Wb/A}$

Derived Unit	**Unit Symbol**	**Derived Quantity**	**Equation Expressed in Terms of SI Base Units**	**Equation Expressed in Terms of Other SI Units**
Degree Celsius	$°\mathrm{C}$	Celsius Temperature	$x\ °\mathrm{C} = x\ \mathrm{K}$, where $-273.15\ °\mathrm{C} \cong 0\ \mathrm{K}$	-
Lumen	lm	Luminous Flux	$\mathrm{lm} = \mathrm{cd\ sr}$	$\mathrm{lm} = \mathrm{cd\ sr}$
Lux	lx	Illuminance	$\mathrm{lx} = \mathrm{cd\ sr\ m^{-2}}$	$\mathrm{lx} = \mathrm{lm/m^2}$
Becquerel	Bq	Activity Referred to a Radionuclide	$\mathrm{Bq} = \mathrm{s^{-1}}$	-
Gray	Gy	Absorbed Dose, Kerma	$\mathrm{Gy} = \mathrm{m^2\ s^{-2}}$	$\mathrm{Gy} = \mathrm{J/kg}$
Sievert	Sv	Dose Equivalent	$\mathrm{Sv} = \mathrm{m^2\ s^{-2}}$	$\mathrm{Sv} = \mathrm{J/kg}$
Katal	kat	Catalytic Activity	$\mathrm{kat} = \mathrm{mol\ s^{-1}}$	-

Sources:

- Derived Unit [1] [2]
- Unit Symbol [1] [2]
- Derived Quantity [1] [2]
- Equation Expressed in Terms of SI Base Units [1] [2]
- Equation Expressed in Terms of Other SI Units [1] [2]