SI units

Science is an international activity. Scientists from different countries work together on the same problems, so it helps if everyone uses the same units for measurements. Scientists around the world use the *Système International* (SI) system of units.

Base units

All SI units are based on a small number of base units. The five base units in the table below are used in this book.

Quantity	SI base unit	Symbol
time	second	s
length	meter	m
mass	kilogram	kg
current	ampere (amp)	A
temperature	kelvin	K

One unit on the Kelvin temperature scale is the same size as 1 degree on the Celsius scale, but the scales start at different points.

Derived units

Most SI units are derived from base units. For example, the unit for area (m^2) is based on the meter.

Quantity	SI unit	
area	square meter (m^2)	
volume	cubic meter (m^3)	
speed and velocity	meters per second (m/s)	
acceleration	meters per second squared (m/s^2)	
frequency	hertz (Hz)	1 Hz = 1 per second
force	newton (N)	
momentum	kilogram meters per second (kg m/s)	
pressure	pascal (Pa)	1 Pa = 1 N/m^2
energy	joule (J)	
power	watt (W)	1 W = 1 J/s
charge	coulomb (C)	
potential difference (voltage)	volt (V)	
resistance	ohm (Ω)	

SI prefixes

A meter isn't a very useful unit for measuring the size of an atom or the distance to Mars, so we add prefixes to standard units to make bigger or smaller versions.

Prefix	Multiplies by	Example
nano (n)	10^{-9}	1 nanometer (nm) = 0.000 000 001 m
micro (μ)	10^{-6}	1 microsecond (μs) = 0.000 001 s
milli (m)	10^{-3}	1 milligram (mg) = 0.001 g
centi (c)	10^{-2}	1 centimeter (cm) = 0.01 m
kilo (k)	10^{3}	1 kilogram (kg) = 1000 g
mega (M)	10^{6}	1 megahertz (MHz) = 1 000 000 Hz
giga (G)	10^{9}	1 gigawatt (GW) = 1 000 000 000 W
tera (T)	10^{12}	1 terawatt (TW) = 1 000 000 000 000 W