

International System of Units (SI)

SI base units		
Quantity	Name	Symbol
length	metre	m
mass	kilogram	kg
time	second	s
electric current	ampere	A
thermodynamic temperature	kelvin	K
amount of substance	mole	mol
luminous intensity	candela	cd

Some SI derived units with special names				
Quantity	Name	Symbol	Expression in terms of other units	Expression in terms of SI base units
frequency	hertz	Hz		s ⁻¹
force	newton	N		m·kg/s ²
pressure	pascal	Pa	N/m ²	kg/m·s ²
energy, work, quantity of heat	joule	J	N·m	kg·m ² /s ²
power, radiant flux	watt	W	J/s	kg·m ² /s ³
quantity of electricity, electric charge	coulomb	C		A·s
electric potential, potential difference, electromotive force	volt	V	W/A	kg·m ² /A·s ³
capacitance	farad	F	C/V	A ² ·s ⁴ /kg·m ²
electric resistance	ohm	Ω	V/A	kg·m ² /A ² ·s ³
conductance	siemens	S	A/V	A ² ·s ³ /kg·m ²
magnetic flux	weber	Wb	V·s	kg·m ² /A·s ²
magnetic field	tesla	T	Wb/m ²	kg/A·s ²
inductance	henry	H	Wb/A	kg·m ² /A ² ·s ²

Some symbols for units of physical quantities			
SI Symbols		Symbols other than SI that are Commonly Used	
Name	Abbreviation	Name	Abbreviation
ampere	A	angstrom	Å
candela	cd	British thermal unit	Btu
coulomb	C	calorie	cal
farad	F	day	d
henry	H	degree	°
hertz	Hz	dyne	dyn
joule	J	electron volt	eV
kelvin	K	foot	ft
kilogram	kg	gauss	G
metre	m	gram	g
mole	mol	horsepower	hp
newton	N	hour	h
ohm	Ω	inch	in.
pascal	Pa	mile	mi
radian	rad	minute (of arc)	'
second	s	minute (of time)	min
siemens	S	pound	lb
steradian	sr	revolution	rev
tesla	T	second (of arc)	"
volt	V	standard atmosphere	atm
watt	W	unified atomic mass unit	u
weber	Wb	year	yr

Some fundamental constants of physics

Constant	Symbol	Computational value
Speed of light in a vacuum	c	3.00 × 10 ⁸ m/s
Elementary charge	e	1.60 × 10 ⁻¹⁹ C
Electron rest mass	m _e	9.11 × 10 ⁻³¹ kg
Permittivity constant	ε ₀	8.85 × 10 ⁻¹² F/m
Permeability constant	μ ₀	1.26 × 10 ⁻⁶ H/m
Electron charge to mass ratio	e/m _e	1.76 × 10 ¹¹ C/kg
Proton rest mass	m _p	1.67 × 10 ⁻²⁷ kg
Ratio of proton mass to electron mass	m _p /m _e	1840
Neutron rest mass	m _n	1.68 × 10 ⁻²⁷ kg
Muon rest mass	m _μ	1.88 × 10 ⁻²⁸ kg
Planck constant	h	6.63 × 10 ⁻³⁴ J·s
Electron Compton wavelength	λ _c	2.43 × 10 ⁻¹² m
Molar gas constant	R	8.31 J/mol·K
Avogadro constant	N _A	6.02 × 10 ²³ /mol
Boltzmann constant	k	1.38 × 10 ⁻²³ J/K
Molar volume of ideal gas at STP ^a	V _m	2.24 × 10 ⁻² m ³ /mol
Faraday constant	F	9.65 × 10 ⁴ C/mol
Stefan-Boltzmann constant	σ	5.67 × 10 ⁻⁸ W/m ² ·K ⁴
Rydberg constant	R	1.10 × 10 ⁷ /m
Gravitational constant	G	6.67 × 10 ⁻¹¹ m ³ /s ² ·kg
Bohr radius	a ₀	5.29 × 10 ⁻¹¹ m
Electron magnetic moment	μ _e	9.28 × 10 ⁻²⁴ J/T
Proton magnetic moment	μ _p	1.41 × 10 ⁻²⁶ J/T
Bohr magnetron	μ _B	9.27 × 10 ⁻²⁴ J/T
Nuclear magnetron	μ _N	5.05 × 10 ⁻²⁷ J/T

Conversion factors

Length						
	cm	METRE	km	in.	ft	mi
1 centimetre =	1	10 ⁻²	10 ⁻⁵	0.3937	3.281 × 10 ⁻²	6.214 × 10 ⁻⁶
1 METRE =	100	1	10 ⁻³	39.3	3.281	6.214 × 10 ⁻⁴
1 kilometre =	10 ⁵	1000	1	3.937 × 10 ⁴	3281	0.6214
1 inch =	2.540	2.540 × 10 ⁻²	2.540 × 10 ⁻⁵	1	8.333 × 10 ⁻²	1.578 × 10 ⁻⁵
1 foot =	30.48	0.3048	3.048 × 10 ⁻⁴	12	1	1.894 × 10 ⁻⁴
1 mile =	1.609 × 10 ⁵	1609	1.609	6.336 × 10 ⁴	5280	1

Area				
	METRE ²	cm ²	ft ²	in. ²
1 SQUARE METRE =	1	10 ⁴	10.76	1550
1 square centimetre =	10 ⁻⁴	1	1.076 × 10 ⁻³	0.1550
1 square foot =	9.290 × 10 ⁻²	929.0	1	144
1 square inch =	6.452 × 10 ⁻⁴	6.452	6.944 × 10 ⁻³	1
1 circular mile =	5.067 × 10 ⁻¹⁰	5.067 × 10 ⁻⁶	5.454 × 10 ⁻⁹	7.854 × 10 ⁻⁷

Volume					
	METRE ³	cm ³	li	ft ³	in. ³
1 CUBIC METRE =	1	10 ⁶	1000	35.31	6.102 × 10 ⁴
1 cubic centimetre =	10 ⁻⁶	1	1.000 × 10 ⁻³	3.531 × 10 ⁻⁵	6.102 × 10 ⁻²
1 litre =	1.000 × 10 ⁻³	1000	1	3.531 × 10 ⁻²	61.02
1 cubic foot =	2.832 × 10 ⁻²	2.832 × 10 ⁴	28.32	1	1728
1 cubic inch =	1.639 × 10 ⁻⁵	16.39	1.639 × 10 ⁻²	5.787 × 10 ⁻⁴	1

Mass							
Quantities in the shaded areas are not mass units but are often used as such. When we write, for example, 1 kg "≈" 2.205lb this means that a kilogram is a mass that weighs 2.205 pounds under standard condition of gravity (g = 9.80665 m/s ²)							
	gm	KG	slug	u	oz	lb	ton
1 gram =	1	0.001	6.852 × 10 ⁻⁵	6.024 × 10 ⁻²³	3.527 × 10 ⁻²	2.205 × 10 ⁻³	1.102 × 10 ⁻⁶
1 KILOGRAM =	1000	1	6.852 × 10 ⁻²	6.024 × 10 ²⁶	35.27	2.205	1.102 × 10 ⁻³
1 ounce =	28.35	2.835 × 10 ⁻²	1.943 × 10 ⁻³	1.708 × 10 ²⁵	1	6.250 × 10 ⁻²	3.125 × 10 ⁻⁵
1 pound =	453.6	0.4536	3.108 × 10 ⁻²	2.732 × 10 ²⁶	16	1	0.0005
1 ton =	9.072 × 10 ⁵	907.2	62.16	5.465 × 10 ²⁹	3.2 × 10 ⁴	2000	1

Density					
Quantities in the shaded areas are weight densities and, as such, are dimensionally different from mass densities. See note for mass table.					
	slug/ft ³	KG/METRE ³	g/cm ³	lb/ft ³	lb/in. ³
1 slug per ft ³ =	1	515.4	0.5154	32.17	1.862 × 10 ⁻²
1 KILOGRAM per METRE ³ =	1.940 × 10 ⁻³	1	0.001	6.243 × 10 ⁻²	3.613 × 10 ⁻⁵
1 gram per cm ³ =	1.940	1000	1	62.43	3.613 × 10 ⁻²
1 pound per ft ³ =	3.108 × 10 ⁻²	16.02	1.602 × 10 ⁻²	1	5.787 × 10 ⁻⁴
1 pound per in. ³ =	53.71	2.768 × 10 ⁴	27.68	1728	1

Time					
	yr	d	h	min	SECOND
1 year =	1	365.2	8.766 × 10 ³	5.259 × 10 ⁵	3.156 × 10 ⁷
1 day =	2.738 × 10 ⁻³	1	24	1440	8.640 × 10 ⁴
1 hour =	1.141 × 10 ⁻⁴	4.167 × 10 ⁻²	1	60	3600
1 minute =	1.901 × 10 ⁻⁶	6.944 × 10 ⁻⁴	1.667 × 10 ⁻²	1	60
1 SECOND =	3.169 × 10 ⁻⁸	1.157 × 10 ⁻⁵	2.778 × 10 ⁻⁴	1.667 × 10 ⁻²	1

Speed						
	ft/s	km/h	METRE/SECOND	mi/h	cm/s	knot
1 foot per second =	1	1.097	0.3048	0.6818	30.48	0.5925
1 kilometre per hour =	0.9113	1	0.2778	0.6214	27.78	0.5400
1 METRE per SECOND =	3.281	3.6	1	2.237	100	1.944
1 mile per hour =	1.467	1.609	0.4470	1	44.70	0.8689
1 centimetre per second =	3.281 × 10 ⁻²	3.6 × 10 ⁻²	0.01	2.237 × 10 ⁻²	1	1.944 × 10 ⁻²
1 knot =	1.688	1.852	0.5144	1.151	51.44	1

1 knot = 1 nautical mi/h 1mi/min = 88.00ft/s = 60.00 mi/h

Force						
Quantities in the shaded areas are not force units but are often used as such. For instance, if we write 1 gram-force "≈" 980.7 dynes, we mean that a gram-mass experiences a force of 980.7 dynes under standard conditions of gravity (g = 9.80665 m/s ²)						
	dyne	NEWTON	lb	pdl	gf	kgf
1 dyne =	1	10 ⁻⁵	2.248 × 10 ⁻⁶	7.233 × 10 ⁻⁵	1.020 × 10 ⁻³	1.020 × 10 ⁻⁶
1 NEWTON =	10 ⁵	1	0.2248	7.233	102.0	0.1020
1 pound =	4.448 × 10 ⁵	4.448	1	32.17	453.6	0.4536
1 poundal =	1.383 × 10 ⁵	0.1383	3.108 × 10 ⁻²	1	14.10	1.410 × 10 ⁻²
1 kilogram-force =	9.807 × 10 ⁷	9.807 × 10 ⁻³	2.205 × 10 ⁻³	7.093 × 10 ⁻²	1	0.001
1 kilogram-force =	9.807 × 10 ⁵	9.807	2.205	70.93	1000	1

Pressure						
	atm	dyne/cm ²	inch of water	cm-Hg	PASCAL	lb/in. ²
1 atmosphere =	1	1.013 × 10 ⁶	406.8	76	1.013 × 10 ⁵	14.70
1 dyne per cm ² =	9.869 × 10 ⁻⁷	1	4.015 × 10 ⁻⁴	7.501 × 10 ⁻⁵	0.1	1.450 × 10 ⁻⁵
1 inch of water ^a at 4° C =	2.458 × 10 ⁻³	2491	1	0.1868	249.1	3.613 × 10 ⁻²
1 cm of mercury ^a at 0° C =	1.316 × 10 ⁻²	1.333 × 10 ⁴	5.353	1	1333	0.1934
1 PASCAL =	9.869 × 10 ⁻⁶	10	4.015 × 10 ⁻³	7.501 × 10 ⁻⁴	1	1.450 × 10 ⁻⁴
1 pound per in. ² =	6.805 × 10 ⁻²	6.895 × 10 ⁴	27.68	5.171	6.895 × 10 ³	1
1 pound per ft ² =	4.725 × 10 ⁻⁴	478.8	0.1922	3.591 × 10 ⁻²	47.88	6.944 × 10 ⁻³

^a Where the acceleration of gravity has the standard value 9.80665 m/s².
1 bar = 10⁶ dyne/cm² = 0.1 MPa 1 millibar = 10³ dyne/cm² = 10² Pa

Energy, work, heat											
Quantities in the shaded areas are not properly energy units but are included for convenience. They arise from the relativistic mass-energy equivalence formula E = mc ² and represent the energy released if a kilogram or unified atomic mass unit (u) is completely converted to energy.											
	Btu	erg	ft·lb	hp·h	JOULE	cal	kWh	eV	MeV	kg	u
1 British thermal unit =	1	1.055 × 10 ¹⁰	777.9	3.929 × 10 ⁻⁴	1055	252.0	2.930 × 10 ⁻⁴	6.585 × 10 ²¹	6.585 × 10 ¹⁵	1.174 × 10 ⁻¹⁴	7.074 × 10 ¹²
1 erg =	9.481 × 10 ⁻¹¹	1	7.376 × 10 ⁻⁸	3.725 × 10 ⁻¹⁴	10 ⁻⁷	2.389 × 10 ⁻⁸	2.778 × 10 ⁻⁸	6.242 × 10 ¹¹	6.242 × 10 ⁵	1.113 × 10 ⁻²⁴	670.5
1 foot-pound =	1.285 × 10 ⁻³	1.356 × 10 ⁷	1	5.051 × 10 ⁻⁷	1.356	0.3239	3.766 × 10 ⁻⁷	8.464 × 10 ¹⁸	8.464 × 10 ¹²	1.509 × 10 ⁻¹⁷	9.092 × 10 ⁹
1 horsepower-hour =	2545	2.685 × 10 ¹³	1.980 × 10 ⁶	1	2.685 × 10 ⁶	6.414 × 10 ⁵	0.7457	1.676 × 10 ²⁵	1.676 × 10 ¹⁹	2.988 × 10 ⁻¹¹	1.800 × 10 ¹⁶
1 JOULE =	9.481 × 10 ⁻⁴	10 ⁷	0.7376	3.725 × 10 ⁻⁷	1	0.2389	2.778 × 10 ⁻⁷	6.242 × 10 ¹⁸	6.242 × 10 ¹²	1.113 × 10 ⁻¹⁷	6.705 × 10 ⁹
1 calorie =	3.968 × 10 ⁻³	4.186 × 10 ⁷	3.087	1.559 × 10 ⁻⁶	4.186	1	1.163 × 10 ⁻⁶	2.613 × 10 ¹⁹	2.613 × 10 ¹³	4.659 × 10 ⁻¹⁷	2.807 × 10 ¹⁰
1 kilowatt-hour =	3413	3.6 × 10 ¹³	2.655 × 10 ⁶	1.341 × 10 ⁶	3.6 × 10 ⁶	8.601 × 10 ⁵	1	2.247 × 10 ²⁵	2.247 × 10 ¹⁹	4.007 × 10 ⁻¹¹	2.414 × 10 ¹⁶
1 electron volt =	1.519 × 10 ⁻²²	1.602 × 10 ⁻¹²	1.182 × 10 ⁻¹⁹	5.967 × 10 ⁻²⁶	1.602 × 10 ⁻¹⁹	3.827 × 10 ⁻²⁰	4.450 × 10 ⁻²⁰	1	10 ⁻⁶	1.783 × 10 ⁻³⁶	1.074 × 10 ⁻⁹
1 million electron volts =	1.519 × 10 ⁻¹⁶	1.602 × 10 ⁻⁶	1.182 × 10 ⁻¹³								