Physics Symbols

and the SI (International System) System of Units

physical quantity	common symbols	name of unit	symbol for unit	unit expressed in base units	unit expressed in other SI units
Length, Distance	*l,d,r,x,y,z,s*	meter	m	Base Unit*	
Area	*A*		m^2		
Volume	*V*		m^3		1000 liters
Mass	*m*	kilogram	kg	Base Unit	
Time	*t*	second	sec or s	Base Unit	
Density	ρ		kg/m^3		
Angle	θ, ϕ	radian	rad	arc length/radius	(see note 9)
Temperature	*T*	kelvin	K	Base Unit	(see note 9)
Velocity	**v**, **u**, *v*		m/s		
Acceleration	**a**, *a*		m/s^2		
Angular Velocity	ω	(see note 10)	rad/sec	1/sec, or s^{-1}	
Angular Acceleration	α		$1/s^2$ or s^{-2}		
Momentum	**p**, *p*		kg m/s		
Frequency	ν, f	hertz	Hz	1/sec or s^{-1}	
Angular Frequency	ω	(see note 10)	1/sec or s^{-1}		
Period	*T*, *t*		s		
Wavelength	λ		m		
Force	**F**, *F*	newton	N	$kg\ m/s^2$	
Torque	**T**, τ, Γ	(see note 11)	N m	$kg\ m^2/s^2$	
Moment of Inertia	*I*		$kg\ m^2$		
Angular Momentum	*L*, **L**		$kg\ m^2/s$		
Work, Energy, Heat	*W,K,E,U,Q*	joule	J	$kg\ m^2/s^2$	N m
Power	*P*	watt	W	$kg\ m^2/s^2$	J/s
Pressure	*p*	pascal	Pa	$kg/m\ s^2$	N/m^2
Density	ρ		kg/m^2		
Specific Heat	*c*		J/kg K		
Current	*I*	ampere	A	Base Unit	
Charge	*q*, *Q*	coulomb	C	A sec	
Volume Charge Density	ρ		C/m^2	$A\ sec/m^2$	
Surface Charge Density	σ		C/m^2	$A\ sec/m^2$	
Linear Charge Density	λ		C/m	A sec/m	
Electric Potential	*V*, Φ	volt	V	$kg\ m^2/A\ s^3$	W/A
Resistance	*R*	ohm	Ω	$kg\ m^2/A^2\ s^3$	V/A
Capacitance	*C*	farad	F	$A^2\ s^2/kg\ m^2$	C/V
Inductance	*L*	henry	H	$kg\ m^2/A^2\ s^2$	Wb/A
Electric Field	**E**		N/C	$kg\ m/A\ s^3$	
Electric Displacement	**D**		C/m^2		
Electric Polarization	**P**		C/m^2		
Magnetic Flux	Φ	weber	Wb	$kg\ m^2/A\ s^2$	V s
Magnetic Induction	**B**	tesla	T	$kg/A\ s^2$	N/A m
Magnetic Field	**H**, **B**	(see note 12)	A/m		
Magnetization	**M**		A/m		

*In 1983 the speed of light was fixed, effectively making m/s a base unit and m a derived unit. However, this difference is not important for our purposes.

Common Metric Prefixes

	kilo (k) = 10^3	Mega (M) = 10^6	Giga (G) = 10^9
centi (c) = 10^{-2}	milli (m) = 10^{-3}	micro (μ) = 10^{-6}	nano (n) = 10^{-9}

Compiled by J. Brennan, TVCC Physics Dept. 1988-93. Please inform me of errors.

Some Usage Notes on Symbols for Physics Units and Quantities

1. Scalar quantities are expressed in italic script, like "*x*, *d*, *s*, *T*, . . ."

2. Vector quantities are expressed in bold script, like "**v**, **a**, **F**, . . .". In handwriting, vectors are indicated by putting an arrow over the symbol: $\vec{\mathrm{v}}$. Vector magnitudes are italic and not bold, or with no arrow over them: "*v*, *a*, *F*, . . ."

3. Greek letters "w, q, a, Φ. . . " are used for angular measurements and also for many other quantities. The same conventions for italic scalars and bold vectors apply to Greek letters.

4. There is no special meaning to the choice of capital or lower-case letters for quantity symbols, but the common usage should be followed. For example, *t* is usually used for time, but *T* is used for temperature.

5. Unit symbols are only capitalized if they are named after a person. Example: g (grams), N (newtons)

6. Capitalization is very important in metric prefixes: compare milli (m) and Mega (M).

7. The *names* of units are not capitalized, even if the symbol for it is: newton (N). If we capitalize it ("Newton"), then we are talking about the man, not the unit.

8. The only SI units that have a symbol consisting of more than one letter are pascals (Pa) and webers (Wb). Note the capitalization.

9. Angle and Temperature are dimensionless quantities. Their units are really just labels and do not have any algebraic value. Including them in a result is not mathematically required (but is usually advised for the sake of clarity). Ex: 5 rad/sec = 5 sec^{-1}

10. A hertz (Hz) is only used in conjunction with ordinary frequencies (cycles per second or revolutions per second). Although it is dimensionally equivalent to 1/seconds, it is never used for angular frequency or angular velocity.

11. Similarly, the units for torque (N m) are dimensionally equivalent to the units for work and energy (joules), but joules are strictly a unit of energy and we never use them as a unit of torque. Torque is just left as newton-meters.

12. There is some confusion in textbooks about the use of "**B**" for either the magnetic field or the magnetic induction. Some authors mean "magnetic induction" when they say "magnetic field". Use the convention adopted by the particular book that you are using.