SYMBOLS, SIGNS, AND ABBREVIATIONS

RECOMMENDED FOR BRITISH SCIENTIFIC PUBLICATIONS

A REPORT

BY

THE SYMBOLS COMMITTEE OF THE ROYAL SOCIETY

REPRESENTING

THE ROYAL SOCIETY
THE CHEMICAL SOCIETY
THE FARADAY SOCIETY
THE PHYSICAL SOCIETY

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Superseding the Report of the Joint Committee of the Chemical Society, the Faraday Society and the Physical Society on 'Symbols for Thermodynamical and Physico-Chemical Quantities and Conventions relating to their Use', issued in 1937

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INTRODUCTION

In 1937 a joint committee of the Chemical Society, the Faraday Society, and the Physical Society issued a *Report on Symbols for Thermodynamical and Physico-Chemical Quantities and Conventions relating to their Use* (CFP, 1937). A few minor amendments were made at the instance of the Royal Society, and the *Report* was then adopted as the basis of practice in the publications of the four Societies and of a number of other British bodies, including the Bureau of Abstracts. The recommendations in the *Report* were given further publicity in the following year when they were embodied (with additional recommendations on abbreviations) by the British Standards Institution in British Standard *Chemical Symbols and Abbreviations* (B.S. 813—1938).

In the preparation of CFP, 1937, attention was given to usages adopted by authors of well-known text-books, as well as to recommendations in earlier reports of other bodies dealing with symbols, including the International Conference on Physics, 1934, the Informal International Conference on Letter Symbols for Heat and Thermodynamics, 1936, and, as regards electrical quantities, the International Electrotechnical Commission. In submitting the *Report*, the joint committee drew special attention to the fact that, although recommendations on the use of physico-chemical symbols had been put forward in the past by a number of bodies, these bodies had nearly always been representative of either physicists or chemists, and not, as in that instance, of both. It was recognized that this constituted an important advance, for by bringing physicists and chemists together many differences had been readily adjusted and a wide measure of agreement attained over the whole of their combined fields of interest.

In order that the advantages of this co-operation should not be lost, the Royal Society set up in 1938 a standing committee on Symbols (R.S. Symbols Committee), on which the Chemical Society, the Faraday Society, and the Physical Society are represented, to consider from time to time any directions in which CFP, 1937, should be revised. In accordance with this undertaking the Royal Society Symbols Committee has drafted the present Report (RCFP, 1951) which has since been adopted by the four Societies concerned as superseding CFP, 1937, and is now put forward as recommended practice in British scientific publications.

Since the war the correlation of the views of physicists and chemists on the use of symbols has been carried further at international level. At the Conference of the International Union of Chemistry in London in 1947, its Commission on Physico-Chemical Symbols and Co-ordination of Scientific Terminologies (P.C.S. Commission) accepted most of the general principles enunciated in CFP, 1937, and adopted, at least as acceptable alternatives, a majority of the symbols recommended for individual quantities; the conclusions of the Commission were published in the *Report* of the Conference (IUC, 1947). At its meetings in London the Commission had the benefit of the advice of representatives of the Symbols, Units, and Nomenclature Commission (S.U.N. Commission) of the International Union of Pure and Applied Physics, who were present by invitation. At the Conference of the latter Union in Amsterdam in 1948, the S.U.N. Commission took cognizance of relevant recommendations in recent reports of national and international bodies, including IUC, 1947. Its own *Report* (IUPAP, 1948) covered much common ground, but naturally extended further into the field of pure and applied physics. In the following year a Conference of the International Union of Pure and Applied Chemistry (which had then reverted to this earlier title) was held in Amsterdam, when its P.C.S. Commission revised IUC, 1947, with special regard to securing the widest measure of agreement with IUPAP, 1948. In the resulting *Report* (IUPAP, 1949) the recommendations in IUC, 1947, and IUPAP, 1948, were almost completely reconciled and co-ordinated, and recommendations in the latter referring to symbols for quantities mainly of interest to physicists were incorporated so as to provide in one *Report* the agreed conclusions of chemists and physicists.

In preparing the present *Report* (RCFP, 1951) the R.S. Symbols Committee has given special attention to the recommendations of these International Commissions and has not departed from them, except, in certain instances, by selecting from alternative symbols for a quantity the one which is most in accord with British usage and, in a few cases, by introducing other alternatives to avoid clashes with symbols for different quantities that may appear in the same equations. Such deviations from the international recommendations have thus been essentially in points of detail and have not arisen from any disagreement on matters of general principle.

In the course of its work, the R.S. Symbols Committee has also maintained close touch with the British Standards Institution, whose Technical Sub-Committee, OC/22/1, has been concurrently engaged in the revision and co-ordination of the existing British Standards *Engineering Symbols and Abbreviations* (B.S. 560—1934) and *Chemical Symbols and Abbreviations* (B.S. 813—1938). In so far as this leads to widening the scope of agreement between physicists and chemists to meet the needs of engineers—at least in respect of symbols for the more fundamental quantities of common interest—a further important step will have been taken towards removing differences of usage in the various branches of pure and applied science and thus providing a firm basis on which to develop consistent practice in more specialized fields.

RECOMMENDATIONS

I. GENERAL PRINCIPLES

(*a*) Alphabets and Founts

In order to make the best use of the limited number of readily available alphabets and founts, it is strongly recommended that the undermentioned principles, already generally approved at international level, should be adopted and strictly followed.

A clear distinction is to be drawn between :

(1) *Symbols for physical quantities* (*see* Schedule A, 1—10) :

These normally consist of single letters of the Latin or the Greek alphabet (sometimes with subscripts or other modifying signs—*see* Schedule B) which are used to represent the quantities concerned, especially in equations showing relationships between them. For a particular quantity the same symbol is to be used irrespective of the units in which it is expressed.

Where letters of the Latin alphabet (*capitals or lower case*) *are used for this purpose, they are to be printed in italic* (*sloping*) *type* except that for vector quantities the customary heavy-faced sans serif type may be used (*see* Schedule A, 9), and where so used for one such quantity must be employed consistently for others in the same discussion. A further permissive variation is the use of bold italic type for certain general constants (*see* Schedule A, 1) ; if this variation is adopted it should also be applied consistently.

(2) *Other symbols and abbreviations*, including :

(i) those denoting mathematical operations and constants (*see* Schedule C) ;
(ii) symbols for the chemical elements ;
(iii) abbreviations for words (*see* Schedules D and E), including abbreviations (symbols) for the names of units (Schedule D).

Where letters of the Latin alphabet (*capitals or lower case*) *are used for any of these purposes, they are to be printed in* roman (*upright*) *type.*

It is not suggested that where Greek letters are involved any attempt should be made to use a sloping fount for symbols for physical quantities and an upright fount for other symbols and abbreviations, though this differentiation has been made for capital letters in the schedules to indicate the possibilities of this refinement. It is useful, however, to use bold Greek letters for certain specified general constants wherever the practice of printing letters of the Latin alphabet for these quantities in bold italic type is adopted (*see* Schedule A, 1).

By making the broad distinction between symbols for physical quantities—to be printed in a sloping fount of type—and other symbols and abbreviations—to be printed in an upright fount of type—at least in so far as letters of the Latin alphabet (including capital letters) are concerned, the pressure on certain overworked letters is notably relieved. A further relief is secured if bold type (italic or Greek) is employed for symbols for general constants ; this has the additional advantage of causing these symbols to stand out against those for variables in equations. Thus, e can be used to denote the base of natural logarithms (a purely mathematical constant—Schedule C), and $\boldsymbol{e}$ to represent the magnitude of the charge of the electron (a physical constant—Schedule A, 1), leaving e for physical variables. Similarly, the use of d to denote the operation of differentiation (Schedule C) leaves d available for physical quantities such as " diameter ", " relative density ", or " current density at an electrode ", but in this particular instance the alternative d is to be regarded as permissive. Again, demands on E for several physical quantities, of which more than one may occur in a single equation, can be partly relieved by adopting $\mathbf{\mathsf{E}}$ for electric force or field strength.

Nevertheless, even with these provisions for the use of different founts, the number of distinctive letter symbols available for physical quantities is insufficient to enable each such symbol to be allotted to a single quantity, and alternatives are therefore required in some instances. Such alternatives are given in the schedules where a need for them is most likely to arise or, in a few cases, where alternative usages are firmly established and unobjectionable. *Where two or more symbols separated by commas are given for a quantity, these symbols are to be regarded as alternatives for which no preference is expressed ; where they are separated by a dotted line, the former is the first preference.* Where it is necessary to select from alternative symbols for a quantity, or to adopt a symbol for a quantity not listed, consideration should be given to current practice by authorities in the field and to the desirability that *symbols for quantities constituting a well-defined class should, if possible, belong to the same alphabet, fount and case.* The selected symbols should be such as to permit of modification in accordance with a uniform scheme for the representation of any important series of corresponding derived quantities.

Abbreviations for words, including abbreviations (symbols) for the names of units, may be used in the text of papers and, in so far as they represent words that vary from one language to another (*see* Schedule E), they are not susceptible to international agreement. Moreover, although it is desirable to secure as wide a measure of agreement as may be readily achieved in English-speaking countries on abbreviations for words in common scientific use, failure to achieve such agreement in respect of individual words should not be regarded as so serious a matter as any disagreement on symbols for physical quantities. It is more important, however, to get agreement on *abbreviations* (*or symbols*) *representing the names of internationally accepted units* (*see* Schedule D, 1). These may consist of single letters (such as V for volt), or of several letters (such as kWh for kilowatt-hour), and *are used following* (*or preceding*) *a number* (e.g., 1·236 V; pH 5·3) *and never as symbols for the corresponding physical quantities in equations.* A single-letter abbreviation for the name of a unit which is identical with or derived from a personal name should always be a capital letter (*see also* below).

(*b*) Other General Principles

Mathematical Usages. There should be no departure from the standard practice of mathematicians in the use of signs, operator symbols, etc. (*see* Schedule C). Numbers should be printed in upright figures. A decimal point should be used to separate whole numbers from the decimals. To facilitate the reading of large numbers the figures may be grouped together in threes, but no commas should be used to separate the groups.

Use of Modifying Signs. For the use of modifying signs such as subscripts, superscripts, and brackets (for examples *see* Schedule B) no rigid rules are laid down, but a satisfactory notation should fulfil the following requirements :

(i) It should be unambiguous.
(ii) It should be systematic, simple and easy to remember.
(iii) It should not be extravagant in using up more letters of the alphabet than necessary.
(iv) It should not be expensive or difficult to print.

The notation ln and log would be preferable to $\log_e$ and $\log_{10}$ respectively because of condition (iv), were it not for condition (i). The use of ln and $\log_{10}$ is encouraged for the time being in the hope that the use of ln may become universal, and it will then be safe to abbreviate $\log_{10}$ to log.

Brackets, including parentheses ( ), braces { }, and square brackets [ ] should not be used around the symbol for a quantity in order to make it represent any other quantity, unless such use is consistently adopted for a whole class of quantities as in crystallography. The use of brackets or braces around a chemical formula to denote, respectively, the molar concentration or the relative activity of the substance fulfils the above general and particular requirements. Most other uses of brackets, apart from their mathematical uses, do not fulfil these requirements.

Conventions for the Representation of Thermodynamic Data for Chemical Reactions. It is recommended that thermodynamic data for chemical reactions be expressed by quoting the equation for the reaction (with such specification of the physical states of participating substances as may be necessary) followed by the magnitude of the change (positive or negative) in the appropriate thermodynamic function. For example, for the heat of reaction at a constant pressure of 1 atm

$$CH_3{\cdot}OH\ (\text{liq.}) + 1\tfrac{1}{2}O_2 = CO_2 + 2H_2O\ (\text{liq.})$$
$$-\ \Delta H\ (\text{at } 298^\circ\ \text{K}) = 726{\cdot}93\ \text{kJ}$$

Similarly, for the heat of the same reaction at constant volume

$$-\ \Delta U\ (\text{at } 298^\circ\ \text{K}) = 728{\cdot}18\ \text{kJ}$$

It is preferred that quantities of heat, as of other forms of energy, be expressed in joules; where data are given in calories the corresponding values in joules should be added, with the conversion factor used. The use of a special symbol to denote the heat *evolved* in a chemical reaction—as was formerly customary in thermochemistry—is not recommended.

Conventions concerning Abbreviations. Abbreviations for the name of units are the same in the singular and the plural, *i.e.*, no ' s ' is to be added when the magnitude is greater than unity.

No definite rule is prescribed for the use of a full point after an abbreviation, but the recommendation is that such points are preferably omitted * wherever this can be done without causing ambiguity (l. is used for litre in order to avoid confusion with the numeral one), and should always be omitted after single capital letters representing the names of units (*see* Schedule D). It is customary however to use a full point after abbreviations for words used in the text and for the names of British units.

II. SPECIFIC USAGES

A. Symbols for Physical Quantities

(*Letters of the Latin alphabet used for this purpose are to be printed in italic type, except in so far as a heavy-faced sans serif type may be employed for vector quantities.*)

1. *General Constants.*

(*Symbols for these constants may be printed in* **bold** *type—italic or Greek—to distinguish them from variables. For purely mathematical constants, see Schedule C.*)

speed of light	$\boldsymbol{c}$, c	Planck's constant	$\boldsymbol{h}$, h
Avogadro's number	$\boldsymbol{N}$, N	Bohr's magneton	$\boldsymbol{\beta}$, β
gas constant per mole	$\boldsymbol{R}$, R	Rydberg's constant	$\boldsymbol{R}$, R
Boltzmann's constant	$\boldsymbol{k}$, k	Stefan–Boltzmann constant	$\boldsymbol{\sigma}$, σ
Faraday's constant	$\boldsymbol{F}$, F	gravitational constant	$\boldsymbol{G}$, G
charge of electron	$-\boldsymbol{e}$, $-e$	gravitational acceleration, standard value	$\boldsymbol{g}$, g_0
mass of electron	$\boldsymbol{m}$, m		

2. *Mensuration.*

length	l	rectangular coordinates	x, y, z
height	h	cylindrical coordinates	$r, \phi, z \ldots \rho, \phi, z$
breadth	b	spherical coordinates	r, θ, ϕ
radius	r		
diameter	d	angle, plane	$\alpha, \beta;\ \theta, \psi$, etc.
		angle, solid	ω
area	A		
volume	V, v		

3. *Kinematics.*

time	t	velocity	v, u
period	T	velocity, angular	ω
frequency	f, ν	acceleration	$a \ldots f$
wave number	$\nu, \tilde{\nu}$	acceleration, angular	α
wave-length	λ	acceleration, gravitational	g

* Nevertheless, full points will be used in the Chemical Society's publications after abbreviations in lower-case letters for all units.

4. *Mechanics.*

mass	m	Young's modulus	E
density	ρ	rigidity	G
density, relative	d	bulk modulus	K
force	F	compressibility	κ
weight	W	Poisson's ratio	$\sigma \ldots \nu$
moment	M	bending moment	M
pressure	p, P	torque	T
work	W, w	modulus of section	Z
energy	E, W	coefficient of friction	μ
energy, kinetic	T	viscosity	η
energy, potential	V	fluidity	ϕ
power (*see also section* 9)	P	viscosity, kinematic	ν
efficiency	η	surface tension	γ, σ
moment of inertia	I		
radius of gyration	k		

5. *Thermodynamics.*

temperature, empirical	$\theta \ldots t$	internal energy	U
temperature, absolute	T	entropy	S
thermal conductivity	λ, k	free energy (Helmholtz function)	F
quantity of heat	Q, q	heat function; enthalpy; total heat	H
thermal expansion, coefficient of	α	Gibbs function	G
heat capacity per unit mass	c	partition function	Q
heat capacity per mole	C		
ratio of specific heats	γ		
Joule–Thomson coefficient	μ		

6. *Chemical Composition and Reaction.*

atomic number	Z	concentration	c, C
atomic weight	A	concentration, molar, of substance X	c_X, C_X, [X]
molecular weight	M	molality	m
number of molecules	N	surface concentration	Γ
number of moles	n	diffusion coefficient	D
stoichiometric number of molecules	ν	velocity constant (of reaction)	k
degree of dissociation (*see also section* 10)	α	activation energy (of reaction)	E
mole fraction	x	equilibrium constant (of reaction)	K
weight fraction	w		
volume fraction	ϕ		

7. *Chemical Thermodynamics.*

chemical potential	μ	activity coefficient (*see also section* 10)	f, γ
activity, absolute	λ	osmotic pressure	Π
activity, relative	a	osmotic coefficient	g
activity, relative, of substance X	a_X, {X}		

8. *Light.*

luminous flux	F, Φ
luminous intensity	I
luminance; brightness (photometric)	L, B
luminance factor	β
luminous radiance	R
illumination	E

absorption factor	α
reflexion factor	ρ
transmission factor	τ
refractive index	$n \dots \mu$ (with subscript)

9. *Electricity and Magnetism.*

electromotive force (*see also section* 10)	E, V
potential; potential difference	V
electric current	I
electric charge	Q
resistance	R
inductance	L
capacitance	C
electric force; electric field strength	$\mathbf{E}, E$
electric flux density; electric displacement	$\mathbf{D}, D$
magnetic flux density; magnetic induction	$\mathbf{B}, B$
magnetic field strength; magnetizing force	$\mathbf{H}, H$
permittivity	ϵ
permittivity, relative; dielectric constant	ϵ_r, ϵ
permittivity, of free space	ϵ_0
permeability	μ
permeability, relative	μ_r, μ
permeability, of free space	μ_0
magnetic vector potential	$\mathbf{A}, A$
electric flux	Ψ
magnetic flux	Φ
current density (*see also section* 10)	$\mathbf{J}, J$
intensity of magnetization; magnetic polarization	$\mathbf{M}, M \dots \mathbf{I}, I$
Poynting vector	$\mathbf{S}, S$

magnetic susceptibility (volume)	κ
magnetic susceptibility (mass)	χ
charge density (volume)	ρ
charge density (surface)	σ
electronic exit work function	ϕ
resistivity; specific resistance	ρ, r
conductivity; specific conductance (*see also section* 10)	σ, γ
dipole moment, electric or magnetic	μ
resistance	R
reactance	X
impedance	Z
conductance	G
susceptance	B
admittance	Y
inductance, self	L
inductance, mutual	M
inductance, self or mutual	L (with subscripts)
energy, electrical	W
power (*see also section* 4)	P
power, reactive	Q
power, apparent (or ' volt-amperes ')	S
phase difference	ϕ
power factor	$\cos \phi$
dielectric loss angle	δ

10. *Electrochemistry.*

degree of electrolytic dissociation (*see also section* 6)	α
valency of an ion	z (negative for anion)
ionic strength	I
activity coefficient (*see also section* 7)	f
activity coefficient, stoichiometric (*see also section* 7)	γ
conductivity; specific conductance (*see also section* 9)	κ
conductance, equivalent or (with subscript m) molar	Λ

ionic conductance, equivalent	$\Lambda \dots l$ (with subscript)
transport number	t, T (with subscript)
electromotive force of voltaic cell (*see also section* 9)	E
single electrode potential	E (with subscript)
current density at an electrode surface (*see also section* 9)	d
electrolytic polarization; overpotential	η
electrokinetic potential	ζ

B. Examples of Subscripts and Other Modifying Signs

1. *Subscripts to Symbols for Quantities.*

I, II ... / 1, 2 ...	*especially with symbols for thermodynamic functions*, referring to different systems or different states of a system.
A, B ...	referring to molecular species A, B, etc.
i	referring to a typical ionic species i.
u	referring to an undissociated molecule.
+, −	referring to a positive or negative ion, or to a positive or negative electrode
p, v, T, S	indicating constant pressure, volume, temperature, and entropy respectively.
p, c, a	*with symbol for an equilibrium constant*, indicating that it is expressed in terms of pressure, concentration, or activity.
G, L, S, X	referring to gas, liquid, solid and crystalline states respectively.
f, e, s, t, d	referring to fusion, evaporation, sublimation, transition, and dissolution or dilution respectively.
c	referring to the critical state or indicating a critical value.
0	indicating limiting value at infinite dilution.
C, D, F	*with symbols for optical properties*, referring to particular wave-lengths.

Where a subscript has to be added to a symbol which already carries a subscript, the two subscripts should be separated by a comma.

Some of the above subscripts may sometimes be more conveniently used as superscripts.

2. *Other Modifying Signs.*

[ ]	*enclosing formula of chemical substance*, indicating its molar concentration.
{ }	*enclosing formula of chemical substance*, indicating its relative activity.

In crystallography it is recommended that:

Millerian indices be enclosed in parentheses, ( );
Laue indices be unenclosed;
indices of a plane family be enclosed in braces, { };
indices of a zone axis or line be enclosed in square brackets, [ ].

Numerals attached to a symbol for a chemical element in various positions have the following meanings:

upper left	mass number of atom,
lower left	nuclear charge of atom,
lower right	number of atoms in molecule;

e.g., ${}^{7}_{3}Li$; ${}^{2}_{1}H_2$.

Ionic charge should be indicated by a superscript plus or minus sign following the symbol of the ion; for multiple charges an Arabic superscript numeral should precede the plus or minus sign; *e.g.*, Na^+, NO_3^-, Ca^{2+}, PO_4^{3-}, ${}^{7}_{3}Li^-$.

A valency state should be indicated by a superscript Roman numeral following the symbol of the element; *e.g.*, Sn^{II}, Sn^{IV}.

In the formula of a free radical the unshared valency should be indicated by a bold-type point in the middle position; *e.g.*, $H_3C\boldsymbol{\cdot}$, $C_6H_5\boldsymbol{\cdot}$, $HO\boldsymbol{\cdot}$.

C. Examples of Symbols and Abbreviations Denoting Mathematical Operations and Constants

(*Letters of the Latin alphabet used for this purpose are to be printed in roman type.*)

limit of y	$\lim y$
tends to a	$\rightarrow a$
average of several values of x	$\bar{x}$
sum of	Σ
product of	Π
division by (solidus), *e.g.*, g/cm²s	/
square root	$\sqrt{}$
nth root	$\sqrt[n]{}$
base of natural logarithms	$\mathrm{e} \ldots \varepsilon$
logarithm of x to base e	$\ln x \ldots \log_{\mathrm{e}} x$
logarithm of x to base 10	$\log_{10} x$
antilogarithm	antilog
exponential function of x	$\exp x$, e^{x}
factorial n	$n\,!$
ratio of circumference to diameter of circle	π
trigonometric functions of θ	$\sin\theta$, $\cos\theta$, $\tan\theta$, $\operatorname{cosec}\theta$, $\sec\theta$, $\cot\theta$
inverse trigonometric functions	$\sin^{-1}\theta \ldots \operatorname{arc\,sin}\theta$, etc.
hyperbolic functions of x	$\sinh x$, $\cosh x$, $\tanh x$, $\operatorname{cosech} x$, $\operatorname{sech} x$, $\coth x$
inverse hyperbolic functions	$\sinh^{-1} x$, etc.
increment or finite difference operator	Δ, δ
*differential coefficient of y with respect to x	$\frac{\mathrm{d}y}{\mathrm{d}x}$, $\mathrm{d}y/\mathrm{d}x$
*differential coefficient, nth	$\frac{\mathrm{d}^n y}{\mathrm{d}x^n}$, $\mathrm{d}^n y/\mathrm{d}x^n$
differential coefficient, partial	$\frac{\partial y}{\partial x}$, $\partial y/\partial x$
operator $\frac{\partial}{\partial x}$ or with single variable $\frac{\mathrm{d}}{\mathrm{d}x}$	D
*integral of y with respect to x	$\int y\,\mathrm{d}x$
*integral of y from $x = a$ to $x = b$	$\int_a^b y\,\mathrm{d}x$
*integral of y around a closed contour	$\oint y\,\mathrm{d}x$
complex operator $\sqrt{(-1)}$	i, j
real part of	$\mathscr{R}$
imaginary part of	$\mathscr{I}$
modulus of complex number z	$\lvert z\rvert$
argument of complex number z	$\arg z$
vector of magnitude A	$\mathbf{A}$
scalar product of $\mathbf{A}$ and $\mathbf{B}$	$\mathbf{A}\,.\,\mathbf{B}$
vector product of $\mathbf{A}$ and $\mathbf{B}$	$\mathbf{A} \times \mathbf{B}$, $\mathbf{A} \wedge \mathbf{B}$
nabla or del, $\left(\mathrm{i}\frac{\partial}{\partial x} + \mathrm{j}\frac{\partial}{\partial y} + \mathrm{k}\frac{\partial}{\partial z}\right)$	∇
Laplacian operator, $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}\right)$	∇^2

* See note on use of d or *d*, p. 1681.

D. Abbreviations (Symbols) for the Names of Units

(*Letters of the Latin alphabet used for this purpose are to be printed in roman type.*)

1. *Internationally Accepted Units.*

(*The use of small roman capitals for single capital letter abbreviations is permissible.**)

metre	m	degree Celsius	° C
micron	μ	degree centigrade	° C
ångström	Å	degree Fahrenheit	° F
		degree Kelvin	°K
square metre	m^2 ... sq.m		
cubic metre	m^3 ... cu.m	lumen	lm
cubic centimetre †	cm^3 ... cu.cm ... c.c.	lux	lx
litre	l.	stilb	sb
		candella	cd
second	s ... sec		
minute	min	electrostatic unit	e.s.u.
hour	h	electromagnetic unit	e.m.u.
		Debye unit	D
hertz	Hz		
cycles per second	c/s	coulomb	C
revolutions per minute	rev/min	ampere	A ... amp
		volt	V
gramme	g	ohm	Ω
kilogramme (mass)	kg		
kilogramme (force)	Kg	electron-volt	eV
dyne	dyn	volt-coulomb	VC
newton	N	volt-ampere	VA
bar	b	farad	F
atmosphere (pressure)	atm	henry	H
poise	P	gauss	G
		weber	Wb
joule	J		
watt	W	normal concentration	N
watt-hour	Wh	molar concentration	M
		molal concentration	m
calorie	cal		
kilocalorie	kcal	hydrogen-ion exponent	pH

2. *Prefixes to Abbreviations for the Names of Units indicating*

Multiples.		*Sub-multiples.*	
tera ($\times 10^{12}$)	T	deci ($\times 10^{-1}$)	d
giga ($\times 10^{9}$)	G	centi ($\times 10^{-2}$)	c
mega ($\times 10^{6}$)	M	milli ($\times 10^{-3}$)	m
kilo ($\times 10^{3}$)	k	micro ($\times 10^{-6}$)	μ
		nano ($\times 10^{-9}$)	n
		pico ($\times 10^{-12}$)	p

3. *Common British Units.*

inch	in.	ounce	oz.
foot	ft.	pound (mass)	lb.
yard	yd.	hundredweight	cwt.
square inch	in.^{2}, sq.in.		
(similarly for foot, etc.)		pound (force)	Lb.
cubic inch	in.^{3}, cu.in.	poundal	pdl.
(similarly for foot, etc.)			
		foot-pound	ft.Lb.
gallon	gal.	horse power	h.p.
grain	gr.	British thermal unit	B.Th.U.

* Small capital letters will be used in such cases in the Chemical Society's publications.
† c.c. (or its alternative ml.) will normally be used in the Chemical Society's publications.

E. Some Abbreviations for Words other than Names of Units

This list is not intended to be exhaustive. The words in this list will often be given in full in the text, but where abbreviations are used the following forms are recommended.

(*To be printed in roman type.*)

absolute	abs.
alternating current	a.c.
anhydrous	anhyd.
approximate (-ly)	approx., *ca.*
aqueous	aq.
atmospheric	atm.
atomic weight	at.wt.
boiling point	b.p.
calculated	calc.
centre of gravity	c.g.
coefficient	coeff.
compound	cpd.
concentrated	conc.
concentration	concn.
constant	const.
corrected	corr.
critical	crit.
crystalline, crystallized (adjective)	cryst.
current density	c.d.
decomposition	decomp.
degree	deg.
dilute	dil.
direct current	d.c.
distilled	dist.
electromotive force	e.m.f.
equation	eqn.
equivalent	equiv.
experiment (-al)	expt.
figure (diagram)	fig.
freezing point	f.p.
gram molecule	mole
horse power, brake	b.h.p.
horse power, effective	e.h.p.
horse power, indicated	i.h.p.
horse power, nominal	n.h.p.
horse power, shaft	s.h.p.
infra-red	i.r.
insoluble	insol.
latent heat	lat.ht.
liquid	liq.
magnetomotive force	m.m.f.
maximum	max.
melting point	m.p.
minimum	min.
molecule, molecular	mol.
molecular weight	mol.wt.
observed	obs.
per cent	% (or in full)
potential difference	p.d.
precipitate	ppt.
preparation	prep.
recrystallized	recryst.
relative humidity	r.h.
root mean square	r.m.s.
section, paragraph	§
soluble	sol.
solution	soln.
specific	sp.
specific gravity	sp.gr.
specific heat	sp.ht.
specific volume	sp.vol.
standard temperature and pressure	s.t.p.
temperature	temp.
ultra-violet	u.v.
vacuum	vac.
vapour density	v.d.
vapour pressure	v.p.
volume	vol.
weight	wt.

ALPHABETICAL INDEX

Of recommended symbols for physical quantities including single letters denoting mathematical constants and operations but not single-letter abbreviations for names of units or other words.

(Names of independent quantities are separated by colons; alternative names for a single quantity are separated by semicolons. Enclosure of the name of a quantity in parentheses indicates that there is an alternative symbol of equal standing; enclosure in square brackets indicates that there is another symbol which is preferred. An asterisk against the name of a quantity indicates that the specified symbol is always used with a subscript when denoting that quantity.)

A	area : atomic weight
$\mathbf{A}$, A	magnetic vector potential
a	acceleration : activity, relative
B	(luminance; brightness) : susceptance
$\mathbf{B}$, B	magnetic flux density; magnetic induction
b	breadth
C	heat capacity per mole : (concentration) : capacitance
c	heat capacity per unit mass : (concentration)
$\boldsymbol{c}$, c	speed of light
D	differential operator
D	diffusion coefficient
$\mathbf{D}$, D	electric flux density; electric displacement
d	differentiation
∂	partial differentiation
d	diameter : relative density : current density at an electrode surface
E	(energy) : Young's modulus : activation energy : illumination : electromotive force : single electrode potential *
$\mathbf{E}$, E	electric force; electric field strength
e	base of natural logarithms
$-\boldsymbol{e}$, $-e$	charge of electron
F	force : free energy; Helmholtz function : (luminous flux)
$\boldsymbol{F}$, F	Faraday's constant
f	(frequency) : [acceleration] : (activity coefficient)
G	rigidity : Gibbs function : conductance
$\boldsymbol{G}$, G	gravitational constant
g	gravitational acceleration : osmotic coefficient
$\boldsymbol{g}$, g_0	gravitational acceleration, standard value
H	heat function; enthalpy; total heat
$\mathbf{H}$, H	magnetic field strength; magnetizing force
h	height
$\boldsymbol{h}$, h	Planck's constant
$\mathbf{I}$, I	[intensity of magnetization]
I	moment of inertia : luminous intensity : electric current : ionic strength
i	(square root of minus one)
$\mathbf{J}$, J	current density
j	(square root of minus one)

K	bulk modulus : equilibrium constant of chemical reaction
k	radius of gyration : (thermal conductivity) : velocity constant of chemical reaction
$\boldsymbol{k}$, k	Boltzmann's constant
L	(luminance ; brightness) : inductance, especially self-inductance : inductance, self or mutual *
l	length : [equivalent ionic conductance *]
$\mathbf{M}$, M	(intensity of magnetization)
M	moment : bending moment : molecular weight : mutual inductance
m	mass : molality
$\boldsymbol{m}$, m	mass of electron
N	number of molecules
$\boldsymbol{N}$, N	Avogadro's number
n	number of moles : refractive index *
P	(pressure) : power
p	(pressure)
Q	(quantity of heat) : electric charge : power, reactive : partition function
q	(quantity of heat)
R	luminous radiance : resistance
$\boldsymbol{R}$, R	gas constant per mole : Rydberg's constant
r	radius : spherical or cylindrical coordinate : (resistivity ; specific resistance)
S	entropy : power, apparent
$\mathbf{S}$, S	Poynting vector
T	period : kinetic energy : torque : temperature, absolute : (transport number *)
t	time : [temperature, empirical] : (transport number *)
U	internal energy
u	(velocity)
V	(volume) : potential energy : potential : potential difference : (electromotive force)
v	(volume) : (velocity)
W	weight : (work) : (energy) : energy, electrical
w	(work) : weight fraction
X	reactance
x	coordinate : mole fraction
Y	admittance
y	coordinate
Z	modulus of section : atomic number : impedance
z	coordinate : valency of an ion
α	(angle) : angular acceleration : coefficient of thermal expansion : degree of dissociation : light absorption factor
β	(angle) : luminance factor
$\boldsymbol{\beta}$, β	Bohr's magneton
Γ	surface concentration
γ	(surface tension) : ratio of specific heats : (activity coefficient, especially stoichiometric) : (conductivity ; specific conductance)
Δ	increment or finite difference operator
δ	increment or finite difference operators : dielectric loss angle
ϵ	[base of natural logarithms] : permittivity
ζ	electrokinetic potential
η	efficiency : viscosity : electrolytic polarization ; overpotential
θ	(angle) : spherical coordinate : temperature, empirical
κ	compressibility : magnetic susceptibility, volume : conductivity ; specific conductance, especially of electrolytes
Λ	equivalent conductance : equivalent ionic conductance *

λ	wave-length : (thermal conductivity) : activity, absolute
μ	coefficient of friction : Joule–Thomson coefficient : chemical potential : [refractive index * permeability : dipole moment
ν	(frequency) : (wave number) : [Poisson's ratio] : kinematic viscosity : stoichiometric number of molecules
$\tilde{\nu}$	(wave number)
Π	product
$\mathit{\Pi}$	osmotic pressure
π	ratio of circumference to diameter
ρ	density : light reflexion factor : electric charge density, volume : (resistivity; specific resistance)
Σ	summation
σ	Poisson's ratio : (surface tension) : electric charge density, surface : (conductivity; specific conductance)
$\boldsymbol{\sigma}$, σ	Stefan–Boltzmann constant
τ	light transmission factor
Φ	(luminous flux) : magnetic flux
ϕ	(angle) : spherical or cylindrical coordinate : fluidity : electronic exit work function : phase difference : volume fraction
χ	magnetic susceptibility, mass
Ψ	electric flux
ψ	(angle)
ω	solid angle : angular velocity