15.3: Appendix C- Symbols for Physical Quantities

This appendix lists the symbols for most of the variable physical quantities used in this e-book. The symbols are those recommended in the IUPAC Green Book (Ian Mills et al, *Quantities, Units and Symbols in Physical Chemistry*, 2nd edition, Blackwell, Oxford, 1993) except for quantities followed by an asterisk (*). The first table lists Roman letter symbols, and the second lists Greek letter symbols.

Symbol	Physical quantity	SI unit
A	Helmholtz energy	J
A_s	surface area	m^2
a	activity	(dimensionless)
B	second virial coefficient	$m^3\ mol^{-1}$
C	number of components *	(dimensionless)
C_p	heat capacity at constant pressure	$J\ K^{-1}$
C_V	heat capacity at constant volume	$J\ K^{-1}$
c	concentration	$mol\ m^{-3}$
E	energy	J
	electrode potential	V
$\boldsymbol{E}$	electric field strength	$V\ m^{-1}$
E_{cell}	cell potential	V
E_j	liquid junction potential	V
E_{sys}	system energy in a lab frame	J
F	force	N
	number of degrees of freedom *	(dimensionless)
f	fugacity	Pa
g	acceleration of free fall	$m\ s^{-2}$
G	Gibbs energy	J
h	height, elevation	m
H	enthalpy	J
$\boldsymbol{H}$	magnetic field strength	$A\ m^{-1}$
I	electric current	A
I_m	ionic strength, molality basis	$mol\ kg^{-1}$
I_c	ionic strength, concentration basis	$mol\ m^{-3}$
K	thermodynamic equilibrium constant	(dimensionless)
K_a	acid dissociation constant	(dimensionless)
K_p	equilibrium constant, pressure basis	$Pa^{\sum \nu}$
K_s	solubility product	(dimensionless)
$k_{H,i}$	Henry's law constant of species i, mole fraction basis	Pa
$k_{c,i}$	Henry's law constant of species i, concentration basis*	$Pa\ m^3\ mol^{-1}$
$k_{m,i}$	Henry's law constant of species i, molality basis*	$Pa\ kg\ mol^{-1}$
l	length, distance	m
L	relative partial molar enthalpy*	$J\ mol^{-1}$
M	molar mass	$kg\ mol^{-1}$
$\boldsymbol{M}$	magnetization	$A\ m^{-1}$

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M_r	relative molecular mass (molecular weight)	(dimensionless)
m	mass	kg
m_i	molality of species i	mol kg^{-1}
N	number of entities (molecules, atoms, ions, formula units, etc.)	(dimensionless)
n	amount of substance	mol
P	number of phases *	(dimensionless)
p	pressure	Pa
	partial pressure	Pa
$\boldsymbol{P}$	dielectric polarization	C m^{-2}
Q	electric charge	C
Q_{sys}	charge entering system at right conductor *	C
Q_{rxn}	reaction quotient*	(dimensionless)
q	heat	J
R_{el}	electric resistance*	Ω
S	entropy	J K^{-1}
s	solubility	mol m^{-3}
	number of species *	(dimensionless)
T	thermodynamic temperature	K
t	time	s
	Celsius temperature	°C
U	internal energy	J
V	volume	m^3
v	specific volume	m^3 kg^{-1}
	velocity, speed	m s^{-1}
w	work	J
	mass fraction (weight fraction)	(dimensionless)
w_{el}	electrical work*	J
w'	nonexpansion work*	J
x	mole fraction in a phase	(dimensionless)
	Cartesian space coordinate	m
y	mole fraction in gas phase	(dimensionless)
	Cartesian space coordinate	m
Z	compression factor (compressibility factor)	(dimensionless)
z	mole fraction in multiphase system *	(dimensionless)
	charge number of an ion	(dimensionless)
	electron number of cell reaction	(dimensionless)
	Cartesian space coordinate	m

Symbol	Physical quantity	SI unit
α	degree of reaction, dissociation, etc.	(dimensionless)
	cubic expansion coefficient	K^{-1}
γ	surface tension	$N\ m^{-1}$, $J\ m^{-2}$
γ_i	activity coefficient of species i, pure liquid or solid standard state *	(dimensionless)
$\gamma_{m,i}$	activity coefficient of species i, molality basis	(dimensionless)
$\gamma_{c,i}$	activity coefficient of species i, concentration basis	(dimensionless)
$\gamma_{x,i}$	activity coefficient of species i, mole fraction basis	(dimensionless)
$\gamma_{\pm}$	mean ionic activity coefficient	(dimensionless)
Γ	pressure factor (activity of a reference state) *	(dimensionless)
ϵ	efficiency of a heat engine	(dimensionless)
	energy equivalent of a calorimeter*	$J\ K^{-1}$
ϑ	angle of rotation	(dimensionless)
κ	reciprocal radius of ionic atmosphere	m^{-1}
κ_T	isothermal compressibility	Pa^{-1}
μ	chemical potential	$J\ mol^{-1}$
μ_{JT}	Joule–Thomson coefficient	$K\ Pa^{-1}$
ν	number of ions per formula unit	(dimensionless)
	stoichiometric number	(dimensionless)
ν_+	number of cations per formula unit	(dimensionless)
ν_-	number of anions per formula unit	(dimensionless)
ξ	advancement (extent of reaction)	mol
Π	osmotic pressure	Pa
ρ	density	$kg\ m^{-3}$
τ	torque*	J
ϕ	fugacity coefficient	(dimensionless)
	electric potential	V
$\Delta\phi$	electric potential difference	V
ϕ_m	osmotic coefficient, molality basis	(dimensionless)
Φ_L	relative apparent molar enthalpy of solute *	$Jmol^{-1}$
ω	angular velocity	s^{-1}

(15.3.2)