List of frequently used symbols and abbreviations; conversion factors

1. Symbols

Symbol	Unit	Property
a		activity
a_{O_2}		oxygen activity
a, b, c	Å, nm	lattice parameters
A		absorbance
b		electron-hole mobility ratio
B	T, G	magnetic induction
B_i		internal magnetic induction
B	$cm^2\ K^{-1}s^{-1}$	Nernst coefficient
B_0, (B_S, B_T)	Pa, bar, $N\ m^{-2}$	bulk modulus (adiabatic, isothermal)
c_{lm}	Pa, dyn cm^{-2}	elastic moduli (stiffnesses)
C	$J\ mol^{-1}\ K^{-1}$, $cal\ mol^{-1}\ K^{-1}$,	heat capacity
C_p		heat capacity at constant pressure
C_m		magnetic heat capacity
c	$J\ g^{-1}\ K^{-1}$	specific heat capacity
C_m	emu $K\ mol^{-1}$ = $cm^3\ K\ mol^{-1}$	Curie constant per mole
d	$g\ cm^{-3}$	density
d_X		X-ray density
d	µm, Å, nm	thickness, (interatomic) distance, bond length
d_{opt}		optical density ($\log I_0/I$)
D	$cm^2\ s^{-1}$	diffusion coefficient
$D_{n(p)}$		diffusion coefficient for electrons (holes)
Dq	eV	crystal field splitting parameter
e		polarization vector
e	C	elementary charge
$e^*_{(T)}$	e	(transverse) effective ionic charge
E	Pa, bar	Young's modulus
$E_{[hkl]}$		Young´s modulus measured in[hkl] direction
E	$V\ cm^{-1}$, $V\ m^{-1}$	electric field strength
E	eV, Ry, J	energy
$E_{a(d)}$		ionization energies of acceptors (donors), energy of acceptor (donor) state
E_A		activation energy (mostly of conductivity)
E_b		binding energy
E^b_{mc}		binding energy of bound multiexcitons
E_C		carbon donor level
$E_{C(V)}$		band edge of conduction (valence) band
E_{crit}		critical point energy
E_F		Fermi energy
E_g		energy gap, band gap
$E_{g,th}$		energy gap extrapolated to 0 K (thermal energy gap)
$E_{g,dir\ (ind)}$		direct (indirect) energy gap
E_{kin}		kinetic (photoelectron) energy

Symbol	Unit	Property
E_p		primary electron energy (in ELS)
$E_{pl(pc)}$, E_{peak}		photoluminescence (photoconductivity) peak energy
E_r		relative energy
E_{tot}		total energy
E_t		trapping energy of charge carrier
E_{thr}		photoelectric threshold energy
$E_{0,1,2,..}$,		energies of critical points in optical spectra (see also E_{crit}
$E(\Gamma_6)$..		energy of band edge of type Γ_6 ...
ΔE		energy loss
f	Hz	frequency
f		oscillator strength
f	kg	frictional force
g		spectroscopic splitting factor
$g_{\|}$		longitudinal g-factor
$g_{\perp}$		transverse g-factor
g_c, g_n		g-factor of conduction electrons
g_v, g_p		g-factor of holes
$g(E)$	various units	density of states (also $N(E)$ or DOS is used)
$g_{c(v)}$		density of conduction (valence) band states
g_V	J	Gibbs energy of formation of a neutral cation vacancy
G	Pa, bar	shear modulus
$G_{[hkl]}$		shear modulus measured in[hkl] direction
G	J mol^{-1}, cal mol^{-1}	free energy
ΔG^0_f	J mol^{-1}	standard free energy of formation
ΔG_{tr}	J mol^{-1}	Gibbs energy of phase transition
h		Planck constant
h	Å	height (of icosahedron)
$h\nu$	eV	photon energy
H	Pa, N m^{-2}, kg mm^{-2}	hardness, microhardness
$H_{B,V,K}$		hardness (Brinell, Vickers, Knoop)
H	Oe, A m^{-1}	magnetic field (strength), also given as $\mu_0 H$ in tesla (T))
H_A		applied magnetic field
H_{cr}		critical magnetic field
H_{ext}		external magnetic field
$\Delta H_{(p\text{-}p)}$	Oe, A m^{-1}	(peak to peak) linewidth of resonance spectrum
H_T	J mol^{-1}	enthalpy at temperature T
ΔH_f $^{(0)}$	J mol^{-1}, cal mol^{-1}, J g-atom^{-1}	(standard) heat of formation
ΔH_{tr}	J mol^{-1}	heat of transformation
i	A cm^{-2}	current density
I	A	electric current
I_{ph}		photocurrent
I	various units	intensity
I_{lum}		luminescence intensity
I_R		Raman intensity
J		total orbital angular momentum quantum number
J	eV	exchange interaction energy (J/k_B in K)
k		extinction coefficient (absorption index)

Symbol	Unit	Property
k	$Å^{-1}$, nm^{-1}	wavevector of electrons
k	dyn $Å^{-1}$	force constant
k_{BB}, $k_{B\text{-}B}$		force constant between B atoms
k, k_B	$J\ K^{-1}$	Boltzmann constant
K	cm^{-1}	absorption coefficient (sometimes α is used)
K, K_B		Knight shift
K_C	$N\ m^{-3/2}$	fracture toughness
L, l	cm	length
$\Delta l/l$		linear thermal elongation
m_0	g	electron mass
$m_{n(p)}$	m_0	effective mass of electrons (holes)
m_{ω_c}	m_0	effective cyclotron resonance mass
m_{ω_p}	m_0	effective plasma frequency mass
m^*	m_0	effective mass
m^{**}	m_0	polaronic mass
$m_{\perp,\parallel}$	m_0	transverse, longitudinal effective mass
$M_{(s)}$	G	(saturation) magnetization per unit volume
n		(linear) refractive index
$n_{a,b,c}$		refractive index in a, b, c direction
Δn		birefringence
n, n_e	g^{-1},$atom^{-1}$, unit $cell^{-1}$,cm^{-3}	electron concentration (n also carrier concentration in general)
$n_{a(d)}$		acceptor (donor) concentration
n_{eff} ,N_{eff}		effective number of electrons per FU, per atom (contributing to opt. properties)
n_H		Hall density
n_i		intrinsic carrier concentration
n_S		spin density
n_t		density of trapping levels
N		count rate, number of electrons
$N(E)$	various units	density of states (see also $g(E)$)
p	Pa, bar	hydrostatic pressure
p_{tr}		(phase) transition pressure
p	μ_B	magnetic moment
p_{eff}		effective (paramagnetic) moment
p_{FU}, p_m		magnetic moment per formula unit
$p_{M,}$ p_A		magnetic moment per ion M, per atom A
p_{RE}		magnetic moment per rare earth atom
p_s		saturation magnetic moment
p	cm^{-3}	hole concentration
P	$C\ m^{-2}$	spontaneous polarization
q	e	Mulliken effective charge
q	$Å^{-1}$, nm^{-1}	wavevector of phonons
Q	$Å^{-1}$	wavevector (frequently reciprocal vector component for neutron scattering)
Q^{-1}		internal friction
$r_{(M)}$	cm, nm, Å	radius (of atom M)
R		reflectivity, reflectance
R	Ω	resistance
R	$J\ K^{-1}\ mol^{-1}$, cal $mol^{-1}\ K^{-1}$	gas constant
R_H	$m^3\ C^{-1}$, $cm^3\ C^{-1}$	normal Hall coefficient

Symbol	Unit	Property
R_s	$m^3\,C^{-1}$, $cm^3\,C^{-1}$	anomalous Hall coefficient
S		spin quantum number
S	J mol^{-1} K^{-1}, cal mol^{-1} K^{-1}	entropy
ΔS_f^0	J mol^{-1} K^{-1}	entropy of formation
ΔS_{tr}	J mol^{-1} K^{-1}	entropy of phase transition
S	mV K^{-1}, μV K^{-1}	Seebeck coefficient (thermoelectric power)
$S(Q,E)$	barn eV^{-1} sr^{-1} $atom^{-1}$	INS response function
t	s, min, h, d, yr	time
t_i		transport numbers (t_+, t_- : for cations, anions)
T		transmission, transmittance
T	K, °C	temperature
T_c		superconductor transition temperature
T_C		Curie temperature
T_{dec} , T_{decomp}		decomposition temperature
T_g		glass transition temperature
T_m		melting temperature
T_N		Néel temperature
T_{perit}		peritectic (decomposition) temperature
T_{prep}		preparation temperature
T_Q		antiferroquadrupolar temperature
T_s		substrate temperature, spin flip temperature
T_{tr}		crystallographic transition temperature
T_V		Verwey temperature
T_α		critical temperature for cluster formation
T_0		characteristic temperature in Mott´s law of variable range hopping
u		position parameter
U	V	voltage (also V is used)
U_H		Hall voltage
U_i		induced voltage
U	eV	Hubbard self-energy, electrostatic correlation energy
U_{ij}	$Å^2$	temperature factors
U_{iso}		isotropic temperature factor
U_{equiv}		equivalent temperature factor
υ	cm s^{-1}	velocity, sound velocity
υ_b		bulk velocity
$\upsilon_{l(L)}$, $\upsilon_{t(T)}$		longitudinal, transverse sound velocity
υ_s		shear sound velocity
υ		valence
V	$Å^3$, nm^3	volume
V_m	cm^3 (mol^{-1})	molar volume
W	eV	width of valence or conduction bands
x, y, z		fractional coordinates of atoms in the unit cell
x		concentration
X_{ik}	bar	stress tensor (6×6) (in the literature often labeled T_{ij})
X_k	bar	stress vector (6-component)
Y		yield of electrons, photoemissive yield
z	K^{-1}	figure of merit ($z = S^2\sigma/\kappa$)
Z		atomic number, coordination number

Symbol	Unit	Property
α (α_F)		Fröhlich polaron coupling constant
α	cm^{-1}	absorption coefficient
α	K^{-1}	linear thermal expansion coefficient
$\alpha_{a,b,c}$		lin. thermal expansion coefficient in *a*, *b*, *c* direction
α, β, γ	deg	unit cell angles
β	K^{-1}	volume thermal expansion coefficient
γ, γ_G		Grüneisen constant
γ		microbrittleness
γ	cm^{-1}	damping constant
γ	Hz T^{-1}, Hz Oe^{-1}	nuclear gyromagnetic ratio
γ	J mol^{-1} K^{-2}	coefficient of electronic heat capacity
γ	Hz	hopping rate
Γ	Oe, $Å^{-1}$	linewidth (e.g. of nuclear Bragg reflection, in ESR)
Γ	cm^{-1}	linewidth (e.g. of phonon wavenumber)
δ	ppm	chemical shift
δ		Anderson-Grüneisen constant
tanδ		dielectric loss tangent ($\varepsilon_2/\varepsilon_1$)
Δ_{cf}	eV	CEF splitting energy
Δ_{el}	eV	electronic stabilization energy
Δ_{ex}	eV	exchange splitting energy
ε_0	F cm^{-1}	permittivity of free space
$\varepsilon = \varepsilon_1 - i\,\varepsilon_2$		dielectric constant
ε_∞		high frequency limit of dielectric constant
ε_o		static dielectric constant
$\varepsilon(0)$, ε_o		low frequency limit of dielectric constant
ε_1, ε_2		real, imaginary part of dielectric constants
ε_L		lattice part of dielectric constant
ε^e		contribution of free electron to ε
Im ε^{-1}		energy loss function
$\Delta\,\varepsilon$		oscillator strength
ζ		reduced wavevector coordinate
θ	deg	diffraction angle
Θ, Θ_p	K	paramagnetic Curie temperature, characteristic temperature
Θ_a	K	asymptotic Curie temperature
Θ_D	K	Debye temperature
Θ_E	K	Einstein temperature
κ	cm^2 dyn^{-1},m^2 N^{-1}, Pa^{-1}	compressibility (= 1/bulk modulus)
κ_L		linear compressibility
κ_V		volume compressibility
κ	W cm^{-1} K^{-1}, W m^{-1} K^{-1}, W mol^{-1} K^{-1}	thermal conductivity
κ_e		charge carrier contribution to κ
κ_L		lattice contribution to κ
λ	nm, µm	wavelength
λ_L		wavelength of laser light
Λ	cm	phonon mean free path

Symbol	Unit	Property
μ	$cm^2\ V^{-1}\ s^{-1}$	mobility of charge carriers
$\mu_{a,b,c}$		mobility in *a*, *b*, *c* direction
μ_{dr}		drift mobility
μ_H		Hall mobility
μ_n, μ_p		electron (hole) mobility
μ_B	$J\ T^{-1}$	Bohr magneton
ν	Hz	frequency
ν_p		plasma frequency
ν_R		Raman frequency
$h\nu$	eV	photon energy
ν		Poisson's ratio
$\bar{\nu}$, ν/c	cm^{-1}	wavenumber
π_{ik}	$cm^2\ dyn^{-1}$	piezoresistance coefficient
Π	eV	Peltier energy
ρ	Ω cm, Ω m	resistivity
$\rho_{a,b,c}$		resistivity in *a*, *b*, *c* direction
$\Delta\rho/\rho_0$		magnetoresistance
σ	Pa	microstrength
σ	emu g^{-1}= G $cm^3\ g^{-1}$, A $m^2\ kg^{-1}$	magnetic moment per unit mass = specific magnetization
σ_m	emu mol^{-1}= G $cm^3\ mol^{-1}$	magnetic moment per mole = molar magnetization
σ	$\Omega^{-1}cm^{-1}$	electrical conductivity
$\sigma_{a,b,c}$		conductivity in *a*, *b*, *c* direction
σ_d		dark conductivity
σ_i		intrinsic conductivity
$\sigma_{n(p)}$		conductivity of electrons (holes)
σ_{ph}		photoconductivity
σ_{opt}	$\Omega^{-1}cm^{-1}$, s^{-1}	optical conductivity
τ	s	relaxation time, rise or decay time, lifetime of carriers
Φ	eV	work function
Φ_e		work function of electrons
Φ	eV	inner lattice potential
χ		magnetic susceptibility
χ_g,	emu g^{-1} = $cm^3\ g^{-1}$,	magnetic susceptibility per gram
χ_m	emu mol^{-1} = $cm^3\ mol^{-1}$	magnetic susceptibility per mole
χ_v		magnetic volume susceptibility
ω	s^{-1}	angular (circular) frequency
ω_p		plasma resonance frequency
$\hbar\omega$	eV	photon energy

2. Abbreviations

A	actinoid element
a	acceptor
a	amorphous
ac	alternating current
AES	atomic emisssion spectroscopy
AF, AFM	antiferromagnetic
AFQ	antiferroquadrupolar
APB	antiphase boundary
APW	augmented plane wave (method)
arb	arbitrary
av	average
bcc	body centered cubic
bct	body centered tetragonal
BZ	Brillouin zone
c	mostly as subscript: cubic, critical or conduction band
calc	calculated
CB	conduction band
CCDW	commensurate charge density wave
cr, crit	mostly as subscript: critical
CS	crystallographic shear (plane)
cub	cubic
CVD	chemical vapour deposition
d, D	donor
dc	direct current
dhcp	double hexagonal close-packed
dHvA	de Haas van Alphen oscillations (method)
DFT	density functional theory
dir	direct
DOS	density of states
DTA	differential thermal analysis
e	electron
EDC	electron (intensity) distribution curve
eff	effective
ELNES	energy loss near edge structure
ELS, EELS	electron energy loss spectrum
EMF	electromotive force
EPMA	electron probe microanalysis
EPR, epr	electron paramagnetic resonance
ESCA	electron spectroscopy for chemical analysis
ESR, esr	electron spin resonance
EXELFS	electron-loss fine structure
exp	experimental
fcc	face centered cubic
F	ferromagnetic
FIR, fir	far infrared
FLAPW	full potential linearized augmented plane wave (method)
FT	Fourier transform
FWHM	full width at half maximum
h	hole
hcp	hexagonal close-packed
hex	hexagonal

HIP	hot isostatic pressing
HT	high temperature T >300 K
I	insulator
i	intrinsic; sometimes used for interstitial
ICDW	incommensurate charge density wave
ind	indirect
INDO	intermediate neglect of differential overlap
ion	ionic, ionization
IR, ir	infrared, irradiation
KKR	Kohn-Korringa-Rostoker method
L, l	mostly as subscript: longitudinal or lattice
L, l, liq	liquid
LA	longitudinal acoustic
LCAO	linear combination of atomic orbitals
LMTO	linearized muffin-tin orbital ((linear combination of muffin-tin orbitals (method))
Ln	lanthanide
LO	longitudinal optical
LSD	local spin density method
LT	low temperature, mainly < 10 K
LTO	longitudinal and transverse optical
m	monoclinic (mostly subscript)
M, Me, M´	metal
magn	mostly as subscript: magnetic
MAS	magic-angle spinning
min (max)	minimum (maximum)
MO	molecular orbit
$Mn^{\bullet}_{Mn}$	Mn ion on Mn site, positively charged
MSC	magnetically stimulated current
MVFF	modified valence force field
NMR	nuclear magnetic resonance
obs	observed
oct	octahedral
O_d	oxygen deficiency (concentration of deficient oxygen atoms)
opt	optical
OPW	orthogonalized plane wave
p	hole
P	paramagnetic
PC	point contact
PDOS	partial density of states
PE	photoelectron spectrum
PEELS	parallel electron energy-loss spectra
ph	as subscript: photon, phonon, photo-
PM	paramagnetic
PVD	physical vapor deposition
R, RE, REE	rare earth element
R	rutile (mostly subscript)
R	as subscript: Raman
rel	relative
res	resolution
RF	radio frequency
rh	rhombohedral
RPA	random phase approximation

RT	room temperature
s	surface
SC	semiconductor
SCF	self consistant field
SICF	single ion in a crystal field
SMT	semiconductor-metal transition
SXS	soft X-ray spectrum
T, TM	transition element
t, T	as subscripts or supersripts: transverse
TA	transverse acoustic
TDOS	total density of states
TEM	transmission electron microscopy
tetr	mostly as subscripts: tetragonal
TG	thermal gravimetry
th	thermal, sometimes for theoretical
theor	theoretical
TIP	temperature independent paramagnetism
TO	transverse optical
tot	mostly as subscript: total
tr	transition (subscript for phase transition prameters)
UPS, UPE	UV photoemission spectroscopy
uv, UV	ultraviolet
v	mostly as subscript: valence band
vac	vacuum, sometimes for vacancy
VB	valence band, as subscript v is used
VCA	virtual crystal approximation
$V_{Ga...}$	vacancy on Ga... site
V'_{Mn}	Mn vacancy, negatively charged
VT	vapor transport
X	anion (e.g.S, Se, Te)
XANES	X-ray absorption near edge structural spectra
XCS	X-ray chemical shift
XPS, XPE	X-ray photoelectron spectroscopy
XRD	X-ray diffraction
⊥, ||	perpendicular, parallel to a crystallographic axis

3. Conversion tables

A. Conversion factors from the SIU system to the CGS-esu and the CGS-emu systems.

Quantities	Sym-bols	SIU	CGS-esu (non-rationalized)	CGS-emu
bulk modulus	B	Pa (= N m^{-2})	10 dyn cm^{-2}	10 dyn cm^{-2}
magnetic induction	B	T (= Wb m^{-2}) = Vs m^{-2}	10^{-6}/3 esu	10^4 G
molar heat capacity at const. pressure	C_p	J K^{-1} mol^{-1}	10^7 erg K^{-1} mol^{-1} (=0.239cal K^{-1} mol^{-1})	10^7 erg K^{-1} mol^{-1} (=0.239cal K^{-1} mol^{-1})
elastic moduli (stiffnesses)	c_{lm}	N m^{-2} (= Pa)	10 dyn cm^{-2}	10 dyn cm^{-2}
density	d	kg m^{-3}	10^{-3} g cm^{-3}	10^{-3} g cm^{-3}
piezoelectric strain coefficient	d_{ik}	C N^{-1} (= m V^{-1})	$3 \cdot 10^4$ esu	10^{-6} emu
strain tensor	e_{ik}	dimensionless	1 (dimensionless)	1 (dimensionless)
piezoelectric stress coefficients	e_{ik}	C m^{-2}	$3 \cdot 10^5$ esu	10^{-5} emu
Young's modulus	E	N m^{-2} (= Pa)	10 dyn cm^{-2}	10 dyn cm^{-2}
electric field strength	E	V m^{-1}	10^{-4}/3 esu	10^6 emu
piezoelectric strain coefficients	g_{ik}	m^2 C^{-1}	10^{-5}/3 esu	10^5 emu
molar free energy change	ΔG	J mol^{-1} (= 0.239 cal mol^{-1})	10^7 erg mol^{-1} (= 0.239 cal mol^{-1})	10^7 erg mol^{-1}
piezoelectric stress coefficient	h_{ik}	V m^{-1} (= N C^{-1})	10^{-4}/3 esu	10^6 emu
hardness	H	N m^{-2} (= Pa)	10 dyn cm^{-2}	10 dyn cm^{-2}
magnetic field strength	H	A m^{-1}	$12\pi \cdot 10^7$ esu	$4\pi \cdot 10^{-3}$ Oe
molar enthalpy change	ΔH	J mol^{-1} (= 0.239 cal mol^{-1})	10^7 erg mol^{-1} (= 0.239 cal mol^{-1})	10^7 erg mol^{-1}
current density	i	A m^{-2}	$3 \cdot 10^5$ esu	10^{-5} emu
elastoresistance coefficients	m_{ik}	dimensionless	1 (dimensionless)	1 (dimensionless)
pressure	p	Pa (= 10^{-5} bar)	10 dyn cm^{-2} (=1.019 $\cdot$ 10^{-5} kg cm^{-2} =7.5 $\cdot$ 10^{-3} Torr)	10 dyn cm^{-2} (=1.019 $\cdot$ 10^{-5} kg cm^{-2} =7.5 $\cdot$ 10^{-3} Torr)
dielectric polarization	P	C m^{-2}	$3 \cdot 10^5$ esu	10^{-5} emu
pyroelectric coefficient	p_i	C m^{-2} K^{-1}	$3 \cdot 10^5$ esu K^{-1}	10^{-5} emu K^{-1}
elastooptic constant (in cubic crystals)	p_{ij}	dimensionless	1 (dimensionless)	1 (dimensionless)
piezooptic constant (in cubic crystals)	q_{ij}	dimensionless	1 (dimensionless)	1 (dimensionless)
Hall coefficient	R_H	m^3 C^{-1}	10^{-3}/3 esu	10^7 emu
linear electrooptic constant	r_{ij}	m V^{-1}	$3 \cdot 10^4$ esu	10^{-6} emu
elastic compliances	s_{ml}	m^2 N^{-1}	10^{-1} cm^2 dyn^{-1}	10^{-1} cm^2 dyn^{-1}
molar entropy change	ΔS	J K^{-1} mol^{-1}	10^7 erg K^{-1} mol^{-1} (= 0.239 cal mol^{-1})	10^7 erg K^{-1} mol^{-1} (= 0.239 cal mol^{-1})
stress tensor	X_{ij}	N m^{-2} (= Pa)	10 dyn cm^{-2}	10 dyn cm^{-2}
thermal conductivity	κ	W m^{-1} K^{-1} (= J m^{-1} s^{-1} K^{-1})	10^5 erg cm^{-1} s^{-1} K^{-1}	10^5 erg cm^{-1} s^{-1} K^{-1}
dielectric constant	ε	dimensionless	1 (dimensionless)	1 (dimensionless)

Quantities	Sym-bols	SIU	CGS-esu (non-rationalized)	CGS-emu
Conversion factors (cont.)				
piezoresistance tensor coefficients	π_{ik}	$m^2\ N^{-1}$	$10^{-1}\ cm^2\ dyn^{-1}$	$10^{-1}\ cm^2\ dyn^{-1}$
piezooptic constant (in cubic crystals)	π_{ik}	$m^2\ N^{-1}$	$10^{-1}\ cm^2\ dyn^{-1}$	$10^{-1}\ cm^2\ dyn^{-1}$
resistivity	ρ	Ω m	$10^{-9}/9$ esu	10^{-11} emu
conductivity	σ	$\Omega^{-1}\ m^{-1}$	$9 \cdot 10^9$ esu	10^{-11} emu
magnetic volume susceptibility	χ_v	dimensionless	$1/4\pi$ (dimensionless)	$1/4\pi$ (dimensionless)
magnetic mass susceptiblity	χ_g	$m^3\ kg^{-1}$	$10^3/4\pi$ esu $cm^3\ g^{-1}$	$10^3/4\pi$ emu g^{-1} (= $10^3/4\pi\ cm^3\ g^{-1}$)
magnetic molar susceptibility	χ_m	$m^3\ mol^{-1}$	$10^6/4\pi$ esu $cm^3\ mol^{-1}$	$10^6/4\pi$ emu mol^{-1} (= $10^6/4\pi\ cm^3\ mol^{-1}$)

Energy conversion

Energy: $E = e\,V = h\,\nu = h\,c\,\bar{\nu}$	1 V As = 1 J = 10^7 erg = $2.38845 \cdot 10^{-4}$ kcal

Energy and equivalent quantities		E [J]	V [V]	ν [Hz, s^{-1}]	$\bar{\nu}$ [cm^{-1}]
1J	≙	1	$6.2415 \cdot 10^{18}$	$1.50916 \cdot 10^{33}$	$5.03403 \cdot 10^{22}$
1V	≙	$1.60219 \cdot 10^{-19}$	1	$2.41797 \cdot 10^{14}$	$8.06547 \cdot 10^3$
$1s^{-1}$ (= l Hz)	≙	$6.62619 \cdot 10^{-34}$	$4.13550 \cdot 10^{-15}$	1	$3.33564 \cdot 10^{-11}$
l cm^{-1}	≙	$1.98648 \cdot 10^{-23}$	$1.23979 \cdot 10^{-4}$	$2.99792 \cdot 10^{10}$	1

Error: Experimental errors are frequently given in parentheses referring to the last decimal places. For example, 1.352(12) stands for 1.352 ± 0.012 and 342.5(21) stands for 342.5 ± 2.1.