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and

INTERNATIONAL FEDERATION OF CLINICAL CHEMISTRY
SCIENTIFIC DIVISION
COMMITTEE ON QUANTITIES AND UNITS†

GLOSSARY OF TERMS IN QUANTITIES AND UNITS IN CLINICAL CHEMISTRY

(IUPAC–IFCC Recommendations 1996)

Prepared for publication by

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Glossary of terms in quantities and units in clinical chemistry (IUPAC–IFCC Recommendations 1996)

Synopsis

From 1967 onwards, a number of documents prepared by the IUPAC/C-QUCC and IFCC/C-QU (from 1996-01-01 C-NPU), with input from many clinical laboratory scientists worldwide, and consistent with standards promulgated by authoritative international scientific organisations, have been published. Because of the importance of a consistent terminology in clinical chemistry and because these documents are often published in journals that may not be readily accessible, the C-NPU has prepared a glossary containing those terms considered of particular interest to the clinical chemistry and clinical laboratory science communities. The glossary has been compiled from definitions taken from published documents of the C-NPU. Also it contains a number of terms, and their definitions, considered relevant to the practice of clinical chemistry, taken from the official documents of other commissions of IUPAC and of international scientific organisations such as the International Organisation for Standardisation, the International Bureau of Weights and Measures and the International Union of Biochemistry and Molecular Biology.

Introduction

The goals of the IUPAC Commission on Quantities and Units in Clinical Chemistry (IUPAC-CQUCC)/IFCC Committee on Quantities and Units (IFCC-CQU) (formerly Expert Panel on Quantities and Units - EPQU) are to participate in the definition and of quantities and units used for health care and related activities, and to ensure that such quantities and units are consistent with standards promulgated by authoritative international standards organizations in metrology. To achieve these goals, a number of documents prepared by the Commission/ Committee, with input from many clinical laboratory scientists worldwide, have been published since 1967 (1 - 10). A compendium of all these publications is currently in preparation.

Because of the importance of a consistent terminology in clinical chemistry and because these documents are often published in journals that may not be readily accessible, the Commission/Committee felt that a glossary containing those terms considered of particular use to the practising clinical chemist would be helpful to the clinical chemistry and clinical laboratory science communities. As a result, the glossary has been compiled from definitions taken from published documents of the Commission/Committee (1-10). Also it contains a number of terms, and their definitions, considered relevant to the practice of clinical chemistry, taken from the official documents of other commissions of IUPAC (11, 15, 17, 18) and of international scientific organizations such as the International Organization for Standardization (ISO) (12, 14), the International Bureau of Weights and Measures (Bureau International des Poids et Mesures-BIPM) (13, 14) and the International Union of Biochemistry and Molecular Biology (IUBMB) (16, 19).

Glossary of terms

For the sake of uniformity some definitions have been slightly modified from the original source.

The entries are given in the form: term, symbol and unit (for quantities).
The use of parentheses around words of some terms means that these words may be omitted if it is unlikely that this will cause confusion.

absolute activity λ 1

Number defined by $\lambda_B = \exp(\mu_B/RT)$ when a component, B, is in a mixture of components (11), where:

μ_B = chemical potential of the component
R = molar gas constant
T = thermodynamic temperature

NOTES 1. The definition applies to specific entities (B) which should be specified as subscripts, i.e. λ_B, μ_B.
2. The term **component** is recommended for clinical chemistry (2), ISO uses the term **substance**.
3. See **relative activity**.

absorbance A 1

Negative logarithm of one minus absorptance as measured on a uniform sample (5).

NOTES 1. $A = -\lg(1 - \alpha) = -\lg \tau = \lg(1/\tau) = \lg(P_o/P_{tr})$
2. Known as decadic absorbance. May be defined analogously as Napierian absorbance: $B = -\ln(1 - \alpha)$
3. The quantity is of practical use if τ refers to an internal measurement.
4. The terms "optical density" and "extinction" have been used for this quantity, but this usage is discouraged because they now have other meanings.

absorbance, lineic See **absorption coefficient**.

absorbed dose D Gy

Energy imparted t matter by ionizing radiation in a suitable small element of volume divided by the mass of that element of volume (15).

absorptance α 1

Radiant power absorbed by a system divided by the incident radiant power (5).

NOTES 1. Also known as absorption factor.
2. The quantity is only of practical use when radiant power is lost solely by absorption by the sample, and there is no loss of radiant power due to scattering or reflection.

absorption See **absorbance** and **absorption coefficient**.

absorption coefficient (linear) a m^{-1}

Absorbance divided by the pathlength of a parallel beam within a uniform sample (5).

NOTES 1. When the absorbance is the decadic absorbance the quantity is called linear (decadic) absorption coefficient.

2. When the absorbance is the Napierian absorbance the quantity is called linear (Napierian) absorption coefficient, symbol α.
3. The term only applies if the decrease in radiant power is due to absorption. If power is lost through other, undefined, processes, the quantity is linear (decadic/Napierian) attenuation coefficient.
4. This quantity may also be called lineic absorbance.
5. Use of the term absorbtance per unit length for this quantity is not recommended.

absorption coefficient (molar) ε $m^2\ mol^{-1}$

Absorption coefficient (linear) due to a component divided by the amount-of-substance concentration of that component in moles (5).

NOTES 1. The quantity is known more precisely as the molar linear decadic absorption coefficient.
2. When the absorbance is the Napierian absorbance, the quantity is called molar linear Napierian absorption coefficient, symbol κ.
3. The term molar (decadic/Napierian) absorbtivity is also used for this quantity.
4. The term **extinction coefficient** was used when concentration is expressed as mass concentration. Use of this term is not deprecated by IUPAC.

absorption factor See **absorptance**.

acceleration a $m\ s^{-2}$

Rate of change of velocity (10).

NOTE $a = dv/dt$

acceleration of free fall g $m\ s^{-2}$

Acceleration of free fall in vacuum due to gravity (10).

NOTE Also called **acceleration due to gravity**.

activity See **(relative) activity**

activity (of a radionuclide) A Bq

Number of nuclear decays occurring in a given quantity of material in a small time interval, divided by the duration of that time interval (15).

activity coefficient γ 1

Number defined in terms of the (relative) activity a_B of the solute substance B in the solution by:

$$a_{M,B} = \gamma_{m,B} m_B / m^- \qquad (T, p \text{ constant}) \quad (11)$$

when the solute substance (component), B, is in a solution containing molalities m_B, m_C,..., of solute substances B, C, ..., in a solvent substance A, and m^- is the standard molality.

NOTES 1. The name activity coefficient may be used for the quantity similarly defined but with substance concentration or mole fraction in place of molality.

2. The term **component** is recommended for clinical chemistry (2), ISO uses **substance**.

amount concentration See **substance concentration**

amount fraction See **substance fraction.**

amount-of-substance n mol

Number of entities divided by the Avogadro constant (11).

NOTES 1. Amount-of-substance is one of the base quantities on which the International System of Units is based (12).

2. See **Système International d'Unités**.
3. The entities may be atoms, molecules, ions, formula units, etc.
4. The term **amount-of-substance** is recommended for clinical chemistry (2), IUPAC also uses **chemical amount** (11).

amount-of-substance concentration See **substance concentration**.

amount-of-substance content See **substance content**.

amount-of-substance fraction See **substance fraction**.

ampere A

Base unit of the SI for electric current, equal to that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross section, and placed 1 metre apart in vacuum, would produce between those conductors a force equal to 2×10^{-7} newton per metre of length (13).

angle $\alpha, \beta, \gamma, \vartheta, \ldots$ rad

Ratio of the arc cut out in a circle with its centre at that point to the radius of the circle (12).

NOTES 1. 1 rad = 1 m m^{-1} = 1

2. See also **radian, degree, minute, second**.

ångström A

Non SI unit of length equal to 10^{-10} m (13).

NOTE The unit is recognized by the CIPM for temporary use with the SI until considered no longer necessary (13).

area A m^{-2}

$A = \iint dx\, dy$ (12).

areic

Modifier used to denote divided by area (7).

atmosphere, standard atm

Non SI unit for pressure, defined by: 1 atm = 101 325 Pa (13).

atomic mass m_a kg

Mass of an atom of a stated nuclide in its nuclear and atomic ground state (11).

NOTE Also called the rest mass of an atom.

atomic mass constant m_u kg

Constant equal to 1/12 of the rest mass of a neutral atom of the nuclide ^{12}C in its nuclear and atomic glound state (11).

NOTE The atomic mass constant is equal to one unified atomic mass unit (11).

atomic mass unit See **unified atomic mass unit**

atomic number Z 1

Number of protons contained in an atomic nucleus (12).

NOTE Also known as proton number.

atomic weight See **relative atomic mass**.

attenuance D 1

Negative logarithm of transmittance of a parallel beam through a uniform sample (5).

NOTES 1. $D = -\lg \tau$, where τ is the transmitance.
2. Known as decadic attenuance. May be defined analogously as Napierian attenuance by $D_e = -\ln \tau$.
3. Attenuance is non specific and may be caused by loss of transmittance of a sample by absorption or scattering.

attenuation coefficient (linear) m m^{-1}

Attenuance, D, divided by the pathlength, l, of a parallel beam through a sample of uniform properties (5).

NOTES 1. $m = D/l = -(\lg \tau)/l$, where τ is the transmitance.
2. Known as linear (decadic) attenuation coefficient. May be defined analogously as linear (Napierian) attenuation coefficient, μ, by $\mu = -(\ln \tau)/l$.
3. This quantity may also be called lineic attenuance.

atto a

Prefix used with SI units to denote 10^{-18} (13).

Avogadro constant L, N_A mol^{-1}

Number of entities in a system divided by the amount-of-substance of those entities (11).

NOTE $L = N/n = 6{,}022\ 136\ 7(36) \times 10^{23}\ mol^{-1}$

bar bar

Non SI unit for pressure equal to 10^5 Pa (13).
NOTE Approved by the CIPM for temporary use with SI units until considered no longer necessary (13).

base quantity

One of the quantities that, in a system of quantities, are conventionally accepted as functionally independent of one another (14).

base unit (of measurement)

Unit of measurement of a base quantity in a given system of quantities (14).

NOTE See **unit** (of measurement).

becquerel Bq

SI unit of (radio)activity, equal to one nuclear decay per second (13).

Boltzmann constant k $J\ K^{-1}$

Molar gas constant divided by the Avogadro constant (11).

NOTES 1. $k = 1{,}380\ 658\ (12)\ 10^{-23}\ J\ K^{-1}$
2. Also called the molecular gas constant.

calorie cal

Unit for energy (heat) whose use with the International System of Units is generally deprecated (13).

NOTES 1. See **international calorie** and **thermochemical calorie**.
2. The use of the unit calorie is also deprecated by ISO, IUPAC and IFCC.

candela cd

Base unit of the SI for luminous intensity, equal to the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540×10^{12} hertz and that has a radiant intensity in that direction of (1/683) watt per steradian (13).

capacitance *C* F

Electrical charge divided by potential difference (12).

catalytic activity *z* kat

Increase in the rate of reaction of a specified chemical reaction that an enzyme produces in a specific assay system (16).

NOTE See **rate of reaction**.

catalytic activity concentration *b* $kat\ m^{-3}$

Catalytic activity of the component divided by the volume of the system (2).

NOTES 1. In clinical chemistry **litre** is recommended as unit for the volume (2).
2. In clinical chemistry the component is usually an enzyme.
3. The term **catalytic concentration** is accepted for use in clinical chemistry.
4. Use of the term level as a synonym for concentration is deprecated.
5. In describing a quantity, **concentration** must be clearly differentiated from **content**.

catalytic activity content *z/m* kat/kg

Catalytic activity of the component divided by the mass of the system (2).

NOTES 1. In clinical chemistry the component is usually an enzyme.
2. The term **catalytic content** is accepted for use in clinical chemistry.
3. Use of the term level as a synonym for concentration is deprecated.
4. In describing a quantity, **content** must be clearly differentiated from **concentration**.

catalytic activity fraction 1

Quotient of the catalytic activity of the isozyme and the catalytic activity of all the isozymes of the same enzyme in the system.

NOTES 1. The term **catalytic fraction** is accepted for use in clinical chemistry.
2. The definition is based on the definitions of **catalytic activity** and **fraction**.
3. The definition also applies to other multiple forms of an enzyme that are not isoenzymes.

catalytic concentration See **catalytic activity concentration**.

catalytic content See **catalytic activity content**.

catalytic fraction See **catalytic activity fraction**.

Celsius temperature t °C

Difference in the thermodynamic temperature of a body and the thermodynamic temperature of the triple point of water, minus 0,01 K (12).

NOTES 1. The thermodynamic temperature of the triple point of water is 273,16 K.
2. The old name **centigrade** for the unit degree Celsius is deprecated.

centi c

Prefix used with SI units to denote 10^{-2} (13).

centripetal acceleration a_{rot} $m\ s^{-2}$

Acceleration of a component as a result of a uniform rotational motion (10).

centrifugal force F_{rot} N

Fictisious force acting on a body as a result of centripetal acceleration (10).

centrifugal radius r m

Distance from the axis of rotation at which the component is spinning at the end of centrifugation (10).

charge See **electric charge** and **elementary charge**.

charge number (of an ion) z 1

Ratio of the electric charge carried by an ion to the elementary charge (18).

chemical amount See **amount-of-substance**

chemical potential μ $J\ mol^{-1}$

Quotient of the differential change in the internal energy of a component in a system and the differential change in the amount-of-substance of the component, maintaining other extensive quantities constant (4).

clearance $\Delta V/\Delta t$ $m^3\ s^{-1}$

Product of the concentration of a component in the output system and the volume flow rate of that output system divided by the concentration of this component in the input system (2).

NOTES 1. The term **mean volume rate** is recommended for this quantity (2).
2. The unit litre per second is recommended for clinical chemistry (2).

coefficient

Proportionality constant, k, in a multiplicative relationship between two quantities, A and B, having different dimensions, ($A = k \bullet B$) (12).

NOTE When the quantities A and B have the same dimension the proportionality constant is called a **factor**.

coherent system of units (of measurement)

System of units of measurement in which all of the derived units are coherent (14).

NOTE See **coherent unit (of measurement)** and **derived unit (of measurement)**.

coherent (derived) unit (of measurement)

Derived unit of measurement that may be expressed as a product of powers of base units with the proportionality factor one (14).

component A, B,....N

Stated part of a system (2).

NOTES 1. When the component is in the form of atoms, molecules or ions it is called a chemical component; ISO uses the term substance.
2. Components may also be cells (e.g. lymphocytes), chemical components that are not clearly characterized e.g. heparins), etc (2).
3. A process ocurring in a system may be conventionally regarded as a component of that system (e.g. coagulation in blood).

concentration See **substance concentration**.

concentration gradient grad C m^{-4}

Differential change in concentration of a component in a given direction in a small distance divided by the distance in that direction (10).

NOTES 1. It is a vector quantity.
2. May be expressed as amount-of-substance, mass, number, volume, concentration gradient.

conductance G S

Reciprocal of the electrical resistance of a conductor (12).

See **resistance**.

conductivity γ $S\ m^{-1}$

Reciprocal of the resistivity of a conductor (12).

See **resistivity**.

content See **substance content**.

conventional true value (of a quantity)

Value attributed to a particular quantity and accepted, sometimes by convention, as having an uncertainty appropriate for a given purpose (14).

coulomb C

SI unit for electric charge, equal to the electric charge carried in one second by a constant current of one ampere (13).

curie Ci

Non SI unit for the activity of a radionuclide, corresponding to $3{,}7 \times 10^{10}$ disintegrations per second (13).

NOTES 1. 1 Ci = $3{,}7 \times 10^{10}$ Bq.
2. Approved by the CIPM for temporary use with the SI until considered no longer necessary.

current density See **electric current density**

cycles per second See **hertz**.

dalton Da

Non SI unit equal to one unified atomic mass unit (11).

NOTES 1. The dalton, with symbol Da, is frequently used in biochemistry to express molecular mass, although the name and the symbol have not been approved by CIPM or ISO.
2. See **unified atomic mass unit**.

day d

Non SI unit for time equal to 86 400 seconds (13).

NOTE Because of its importance and wide use, the CIPM approved the use of the day with SI units (13).

deca da

Prefix used with SI units to denote 10^1 (13).

decay constant See **disintegration constant**.

deci d

Prefix used with SI units to denote 10^{-1} (13).

degree °

Non SI unit for plane angle, equal to $\pi/180$ rad (13).

NOTE Because of its importance and wide use, The CIPM approved use of the degree with SI units (13).

degree Celsius °C

Special name used in place of kelvin to express Celsius temperature (13).

degree of dissociation α 1

Ratio of the number of dissociated molecules of a substance to the total number of molecules (12).

density ρ $kg\ m^{-3}$

Mass of a substance or body divided by its volume (11).

NOTES 1. The recommended systematic name is **volumic mass** (7).
2. See **mass density**.

derived quantity

Quantity defined, in a system of quantities, as a function of base quantities of that system (14).

NOTE See **quantity** and **base quantity**.

derived unit (of measurement)

Unit of measurement of a derived quantity in a given system of quantities (14).

NOTES 1. See **unit** (of measurement) and **derived quantity**.
2. Derived units are expressed algebraically in terms of base units by means of the mathematical symbols of multiplication and division.

diffusion coefficient D $m^2\ s^{-1}$

Absolute value of the product of the local number concentration of a component and the local average velocity of particles of that component divided by the number concentration gradient in the direction of movement (10).

dimension (of a quantity)

Expression that represents a quantity of a system of quantities as the product of powers of factors that represent the base quantities of the system (14).

NOTE See **base quantity**.

dimensionless quantity See **quantity of dimension one.**

disintegration constant λ s^{-1}

Probability of disintegration in a small time interval divided by the duration of the time interval (12).

NOTES 1. Also called **decay constant**.
2. Used primarily for radionuclide decay.

distribution constant K_D 1

Quotient of the concentration of a component in a single definite form in an organic solvent phase, or in the chromatographyc stationary phase, and its concentration in the same form in the aqueous phase, or in the chromatographyc mobile phase, at equilibrium (17).

NOTES 1. For clinical chemistry the term **component** is recommended (2), ISO uses **substance**.
2. Also called partition coefficient, but use of this term is not recommended for this quantity (17).

distribution ratio D 1

Quotient of the amounts of a component in two phases (17).

NOTES 1. For clinical chemistry the term **component** is recommended(2), ISO uses **substance**.
2. The quantity is used most frequently in chromatography, regarding the stationary phase and the mobile phase (17).
3. The amount of component is the measured amount regardless of its form (cf. **distribution constant** refers to a specific form of the component).
4. The quantity may be expressed as concentrational distribution ratio (D_c) when the amount of component is given as concentration.
5. Different units may be used for the stationary phase:
   i. gram dry phase (D_g - $m^3\ g^{-1}$).
   ii. cubic metre of bed volume (D_v - 1).
   iii. square metre of surface (D_s - m).

dose See **absorbed dose** and **dose equivalent**.

dose equivalent (effective of radiation) H Sv

Absorbed dose multiplied by a quality factor and the product of all other modifying factors, aimed at expressing on a common scale, for different types of radiations and distributions of absorbed dose, the biological effects associated with exposure (15).
NOTE See also **absorbed dose**.

dynamic viscosity See **viscosity**

electric capacitance See **capacitance**.

electric charge Q C

Integral of electric current over time (12).

NOTE See **electric current**.

electric conductance See **conductance**.

electric conductivity See **conductivity**.

electric current I A

Base quantity of the International System of Units (12).

NOTE See **Systéme International d'Unités**.

electric current density J $A\ m^{-2}$

Electric current divided by area (12).

NOTES 1. It is the current per area of an electrode.
2. Systematic name is areic electric current.

electric field strength E $V\ m^{-1}$

Force exerted by an electric field on a point charge divided by the electric charge (12).

electric mobility See **mobility**.

electric potential difference (of a galvanic cell) ΔV V

Difference in the potentials of electrodes on the right and left of a galvanic cell (11).

NOTE When ΔV is positive, positive charge flows from left to right through the cell.

electric resistance See **resistance**.

electric resistivity See **resistivity**.

electrode potential E V

Electromotive force of a cell in which the electrode on the left is a standard hydrogen electrode and the electrode on the right is the electrode in question (11).

electrokinetic potential ζ V

Electric potential difference between the fixed charges on the immobile support and the diffuse charge in the solution (9).

NOTE Also called **zeta potential**.

electromotive force E V

Energy supplied by a source divided by the electric charge transported through the source (12).

electronvolt eV

Kinetic energy acquired by an electron passing through a potential difference of one volt (13).

NOTES 1. $1\ eV = 1{,}602\ 177\ 33(49) \bullet 10^{-19}\ J$ (13).
2. One electronvols is the elementary charge multiplied by 1 V.
3. Because of its importance and use in specialized fields, the CIPM approved use of the electronvolt with SI units (13).

electrophoretic mobility See **mobility**

elementary charge e C

Electric charge of a proton (12).

NOTES 1. The value of the elementary charge is apromimately equal to 1,602 177 33(49)•10^{-19} C (11).
2. This quantity is also used as an atomic unit of electric charge (11).

emittance ε 1

Radiant exitance of a sample divided by the radiant exitance of a black body at the same temperature (5).

NOTES 1. The term emittance is preferred to the more widely used term "emissivity", which has been designated other meanings.
2. As with other radiation quantities, emittance varies with wavelength.

enthalpy H J

Thermodynamic quantity qiven by the sum of the internal energy and the product of the pressure and volume of a system (12).

entitic

Modifier used to denote divided by number of entities (7).

entropy S $J K^{-1}$

Quantity defined by $dS = dQ/T$ when an amount of heat dQ is received by a system having a thermodynamic temperature T, provided that no irreversible change takes place in the system (12).

enzyme activity See **catalytic activity**.

equilibrium constant (concentration) K_c $(\text{mol m}^{-3})^{\Sigma\upsilon}$

Product of the substance concentrations of the components of a specified reaction to the power of their stoichiometric numbers in the reaction equation (11).

NOTES 1. See **stoichiometric number**.
2. The equilibrium constant may be defined in terms of:
   i. molality, K_m $[(\text{mol kg}^{-1})^{\Sigma\upsilon}]$, when instead of concentrations molalities are used.
   ii. pressure, K_p $[\text{Pa}^{\Sigma\upsilon}]$, when components are gases and concentrations are expressed in terms of **pressure**.

erg erg

Non SI unit for energy (13).

NOTES 1. 1 erg = 10^{-7} J.
2. The erg is a unit of the CGS unit system, and its use is discouraged.

exa E

Prefix used with SI units to denote 10^{18} (13).

extent of reaction $\Delta\xi$ mol

Change in the amount-of-substance of a component divided by the stoichiometric coefficient of the component (11).

NOTES 1. Extent of reaction $\Delta\xi = \Delta n_B/\vartheta_B$.
2. For clinical chemistry the term **component** is recommended (2), ISO uses **substance**.

extinction

Sum of the effects of absorption, scattering, and luminescence (11).

NOTE Use of the term extinction to denote absorbance is deprecated by IUPAC.

extinction coefficient See **absorption coefficient** (linear).

NOTE Use of the term extintion coefficient to denote **absortion coefficient** is deprecated by IUPAC.

factor

Proportionality quantity, k, in a multiplicative relation between two quantities, A and B, having the same dimension, $A = k \bullet B$ (12)

NOTE When the quantities A and B have different dimensions the proportionality quantity is called a **coefficient**.

farad F

SI unit for capacitance, equal to the capacitance of a capacitor between the plates of which there appears a potential difference of 1 V when it is charged by a quantity of electricity of 1 C (13).

NOTE 1 F = m^{-2} kg^{-1} s^4 A^2.

Faraday constant F C mol^{-1}

Product of the Avogadro constant and the charge of the proton (11).

femto f

Prefix used with SI units to denote 10^{-15} (13).

flux J_X (unit of X) $s^{-1}\,m^{-2}$

Rate of movement of a quantity X per area of surface normal to flow, or interface through which the movement is taking place (11).

NOTES 1. Flux may be expressed by $(dX/dt)A^{-1}$.
2. Flux is sometimes used to express transfer or movement of a component within a system or across its boundary.
3. Transfer may be expressed as a flow rate, for example areic mass rate, areic substance rate or areic volume rate (8).
4. This definition may not be useful for transport phenomena in electrochemical systems.

force F N

Vector quantity equal to the product of the mass of a body and its acceleration (10).

NOTE $F = m(dv/dt) = m\,a$

fraction 1

Quotient where the numerator quantity refers to a component while the denominator is a quantity of the same kind for the whole system (7).

NOTE From the definition, a fraction has a value between zero (included) and one (included).

frequency ϑ Hz

Number of regular events in a given time divided by that time (12).

NOTE For electromagnetic radiation the frequency is related to photon energy by $E = h\vartheta$, where is the Planck constant. Frequency is also related to the speed of light, c, and the wavelength, λ by the expression $\vartheta = c/\lambda$ (11).

friction coefficient See **friction factor.**

friction factor μ 1

Quotient of frictional force and normal force, for a sliding body (12).

NOTE Formerly called **frictional coefficient** or coefficient of friction.

gas constant See **molar gas constant**

Gibbs energy G J

Thermodynamic quantity equal to the difference between the enthalpy of a system and the product of the thermodynamic temperature to the entropy of this system (12).

giga G

Prefix used with SI units to denote 10^9 (13).

gram g

Base unit for mass in the CGS system of units (13).

NOTES 1. The gram is equal to 10^{-3} kilogram, the SI base unit for mass.
2. Names of decimal multiples and submultiples of the unit of mass within the SI are formed by attaching prefixes to the word "gram".

gray Gy

SI unit for absorbed dose of radiant energy, equal to one joule per kilogram (13).

NOTE The gray is a special unit of the SI permitted by the GIPM for reasons of safeguarding human health (13).

half life $T_{½}$ s

Average time required for the exponential decay of one half of the atoms of a sample of a radionuclide (12).

NOTES 1. The term is generally used to denote the time taken in a chemical reaction for the initial amount (mass, amount-of-substance, concentration, etc.) of the component (substance) to be halved.
2. The term also denotes the time in which the concentration of a substance will be reduced by half, assuming a first order elimination process.

heat capacity C $J K^{-1}$

Quantity equal to dQ/dT, where dT is the increase in thermodynamic temperature as a result of the addition of an amount of heat dQ to a system (12).

hecto h

Prefix used with SI units to denote 10^2 (13).

henry H

Inductance of a closed circuit in which an electromotive force of 1 volt is produced when the electric current in the circuit varies uniformly at the rate of 1 ampere per second (13).

NOTES 1. The henry is the SI unit for inductance (13).
2. $H = 1\ m^2\ kg\ s^{-2}\ A^{-2}$

hertz Hz

SI unit for frequency, equal to one cycle per second (13).

hour h

Non-SI unit for time, equal to 3 600 s (13).

NOTE Because of its importance and wide use, the CIPM approved use of the hour with SI units (13).

illuminance E lx

Luminous flux incident on an element of a surface, divided by the area of that element (12).

impedance Z Ω

Complex representation of potential difference divided by the complex representation of current (12).

NOTE See **resistance.**

internal energy U J

Quantity defined as the sum of the heat Q added to a system and the work W done on the system (11).

NOTE $U = Q + W$. When $Q > 0$ and $W > 0$ there is an increase in the internal energy of the system.

international calorie cal_{IT}

Non-SI unit for energy, equal to 4,186 8 J (13).

NOTES 1. The international calorie is distinguished from the thermochemical calorie by use of the notation cal_{IT}.
2. See **calorie** and **thermochemical calorie**.
3. Use of the unit **international calorie** is deprecated by CIPM, ISO, IUPAC and IFCC.

International System of Units See **Système International d'Unités**.

international unit int. unit

Arbitrary unit for a measurement that is agreed upon by the World Health Organization (2).

NOTE Frequently used to express the results of measurement of a biological activity of a component.

ionic concentration See **concentration**.

ionic strength (concentrational) I_c mol m^{-3}

One half the product of the concentration of an ion and its charge to the power 2 (11).

NOTES 1. The ionic strength of a solution containing several ions is the sum of the ionic strengths of the individual ions: $I_c = \frac{1}{2}\Sigma c_B z_B^2$

2. Ionic strength may also be expressed in terms of **molality** ($I_m = \frac{1}{2}\Sigma m_B z_B^2$, unit: mol kg^{-1}).

ionic transport number t 1

Quotient of the current carried by an ionic component and the total current (12).

NOTE For clinical chemistry the term **component** is recommended (2), ISO uses **substance**.

irradiance E W m^{-2}

Radiant power received by an element of surface divided by the area of that element (5).

NOTE See **radiant exitance**.

joule J

SI unit for energy, equal to the work done when the point of application of a force of one newton is displaced through a distance of one metre in the direction of the force (13).

NOTE 1 J = 1 N m = 1 m^2 kg s^{-2}.

katal kat

Unit for catalytic activity coherent with the SI, equal to the catalytic activity that catalyzes a reaction rate of one mole per second in an assay system (16).

NOTES 1. 1 kat = 1 mol s^{-1} (16).

2. The katal is recommended for use in the specific context of enzymes and clinical chemistry (2).

kelvin K

Base unit of the SI for thermodynamic temperature, equal to the fraction 1/273,16 of the thermodynamic temperature of the triple point of water (13).

kilo k

Prefix used with SI units to denote 10^3 (13).

kilogram kg

Base unit of the SI for mass, equal to the mass of the international prototype of the kilogram (13).

NOTE The names of the multiples and sub-multiples of the unit of mass are formed by adding the prefixes to the word gram.

kind-of-quantity

Abstract property common to several real quantities (2).

See **quantity**.

kinetic energy E_k J

Energy of a body due to motion (11).

NOTE $E = \frac{1}{2}mv^2$

kinematic viscosity ϑ $m^2 s^{-1}$

Quotient of the viscosity and the density (11).

length l m

Base quantity of the international system of units (12).

NOTE See **Systeme International d'Unités**.

life-time See **mean life**

linear absorption coefficient See **absorption coefficient (linear)**.

linear attenuation coefficient See **attenuation coefficient (linear)**.

lineic

Modifier used to denote divided by length (7).

lineic absorbance See **absorption coefficient**.

litre l or L

Non SI unit for volume, equal to 10^{-3} m^3 (13).

NOTES 1. Because of its importance and wide use, the CIPM approved use of the litre with SI units.
2. The litre is the recommended volume for reporting results of clinical laboratory measurements, e.g. concentrations (2).

lumen lm

SI unit for luminous flux, equal to the luminous flux emitted in unit solid angle (steradian) by uniform point source having a luminous intensity of 1 candela (13).

NOTE 1 lm = 1 cd sr

luminous flux $d\phi$ lm

Quantity defined as $I \bullet d\Omega$, where I is the luminous intensity in an element of solid angle $d\Omega$, of a source (12).

luminous intensity I cd

Base quantity of the International System of Units (12).

NOTE See **Système International d'Unités**.

lux lx

SI unit for illuminance, equal to one lumen per square metre (13).

NOTE 1 lx = 1 m^{-2} cd sr.

mass m kg

Base quantity of the International System of Units (12).

NOTES 1. See **Système International d'Unités**.
2. For a body, mass is the proportionality constant for the relation between the force applied to the body and its acceleration (12).

mass concentration ρ kg m^{-3}

Mass of the component divided by the volume of the system (2).

NOTES 1. In clinical chemistry **litre** is recommended as unit for the volume (2).
2. For clinical chemistry the term **component** is recommended (2), ISO uses **substance**.
3. For clinical chemistry the term **system** is recommended (2), ISO uses **mixture**.
4. Use of the term level as a synonym for concentration is deprecated.

mass density ρ $kg\ m^{-3}$

Mass of a system divided by its volume (10).

NOTE The name volumic mass is recommended for this quantity (7).

mass density gradient **grad** ρ $kg\ m^{-4}$

Change in mass density in a small distance divided by that distance (10).

mass flow rate q_m $kg\ s^{-1}$

Mass of a mater crossing a surface divided by the time (12).

mass fraction w 1

Quotient of the mass of a component and the mass of the system containing the component (12).

NOTES 1. For clinical chemistry the term **component** is recommended (2), ISO uses **substance**.
2. For clinical chemistry the term **system** is recommended (2), ISO uses **mixture**.

mass number A 1

Number of nucleons in an atomic nucleus (12).

NOTE Also called nucleon number.

massic

Modifier used to denote divided by mass (7).

mean life τ s

Number of entities of a component in a system at equilibrium divided by the number of entities of the component being transformed per time (18).

NOTES 1. See **half-life**.
2. For a reacting system with first order kinetics, the mean life of a component is the time taken for the concentration of the component to fall to 1/e of its initial value.
3. This quantity is also called **life-time**.

mean volume rate See **clearance**.

measurand

Particular quantity subject to measurement (14).

mega M

Prefix used with SI units to denote 10^6 (13).

metre m

Base unit of the SI for length, equal to the length of the path travelled by light in vacuum during a time interval of 1/299 792 458 of a second (13).

Michaelis constant K_m mol m^{-3}

Substance concentration of substrate at which the rate of reaction is equal to one half of the limiting rate (maximum rate) (19).

NOTES 1. Also called the Michaelis concentration
2. The Michaelis constant (Michaelis concentration) may be used only when Michaelis-Menten kinetics is obeyed.

micro μ

Prefix used with SI units to denote 10^{-6} (13).

milli m

Prefix used with SI units to denote 10^{-3} (13).

millimetre of mercury mmHg

Non SI unit for pressure (13).

NOTES 1. 1 mmHg ≈ 133,322 Pa.
2. This old unit is not recognized by CIPM or ISO, but it is used for blood pressure.

minute (of arc)

Non SI unit for plane angle, equal to $(\pi/10\ 800)$ rad (13).

NOTE Because of its importance and wide use, the CIPM approved use of the minute of arc with SI units (13).

minute (of time) min

Non SI unit for time, equal to 60 s (13).

NOTE Because of its importance and wide use, the CIPM approved use of the minute of time with SI units (13).

mobility (electric) μ $m^2\ V^{-1}\ s^{-1}$

Average drift velocity imparted to a charged particle in a medium by the electric field divided by the field strength (11).

NOTE Is often preceded by the term electrophoretic or electrolytic to indicate mobility in a specific system.

molal See **molality**.

molality m $mol\ kg^{-1}$

Amount-of-substance of a solute substance (component) (in a solution) divided by the mass of the solvent (11).

NOTES 1. The term **component** is recommended for clinical chemistry (2), ISO uses **substance**.
2. Use of the term molal for this quantity is not recommended.

molar

Modifier used to denote divided by amount-of-substance (7).

NOTE Use of the term molar to denote a unit of amount-of-substance concentration is discouraged.

molar absorptivity See **molar absorption coefficent**.

molar absorption coefficient See **absorption coefficient** (molar).

molar concentration See **substance concentration**.

molar conductivity Λ S $m^2\ mol^{-1}$

Conductivity of an electrolyte divided by its substance concentration (11).

NOTES 1. See **conductivity** and **resistivity**.
2. See **substance concentration**.

(molar) gas constant R $J\ K^{-1}\ mol^{-1}$

Universal constant of proportionality in the ideal gas law (11).

NOTE The gas constant is equal to the product of the Avogadro constant and the Boltzmann constant:

$R = Lk = 8{,}314\ 510\ (70)\ J\ K^{-1}\ mol^{-1}$

molar heat capacity C_m $J\ mol^{-1}\ K^{-1}$

Heat capacity divided by amount-of-substance (12).

NOTE See **heat capacity**.

molar mass M $kg\ mol^{-1}$

Mass of a component divided by its amount-of-substance (12).

NOTE The term **component** is recommended for clinical chemistry (2), ISO uses **substance**.

molar volume V_m $m^3\ mol^{-1}$

Volume of a component divided by its amount-of-substance (12).

NOTE The term **component** is recommended for clinical chemistry (2). ISO uses **substance**.

molarity See **substance concentration**.

NOTE Use of the term molarity to describe the amount-of-substance concentration is not recommended.

mole mol

Base unit of the SI for amount-of-substance, equal to the amount-of-substance of a system which contains as many elementary entities as there are atoms in 0,012 kilogram of carbon 12 (13).

NOTE When the mole is used, the elementary entities must be specified and may be atoms, molecules, ions, electrons, other particles, or specified groups of such particles.

mole fraction See **substance fraction.**

molecular weight See **relative molecular mass**

moment of inertia I $m^2\ kg$

Sum (or integral) of the products of the masses of the elements of a body rotating about an axis and the squares of their distances from the axis (10).

nano n

Prefix used with SI units to denote 10^{-9} (13).

newton N

SI unit for force, equal to the force required to accelerate a body with the mass one kilogram by one metre per second per second (13).

NOTE $1\ N = m\ kg\ s^{-2}$.

number concentration C_N m^{-3}

Number of defined particles, or elementary entities, of a component in a system divided by the volume of that system (2).

NOTES 1. In clinical chemistry, the **litre** is recommended as a unit for the volume of system (2).
2. The term **component** is recommended for clinical chemistry (2), ISO uses **substance**.
3. The term **system** is recommended for clinical chemistry (2), ISO uses **mixture**.
4. Use of the term level as a synonym for concentration is deprecated.
5. In describing a quantity, **concentration** must be clearly distinguished from **content**.

number content N_B/m kg^{-1}

Number of defined particles, or elementary entities, of a component in a system divided by the mass of that system (2).

NOTES 1. The term **component** is recommended for clinical chemistry (2), ISO uses **substance**.
2. The term **system** is recommended for clinical chemistry (2), ISO uses **mixture**.
3. Use of the term level as a synonym for concentration is deprecated.
4. In describing a quantity, **content** must be clearly distinguished from **concentration**.

number fraction x 1

Number of defined particles, or elementary entities of a specified component divided by the total number of defined particles in the system (2).

NOTES 1. The term **component** is recommended for clinical chemistry (2), ISO uses **substance**.
2. The term **system** is recommended for clinical chemistry (2), ISO uses **mixture**.

number flow rate q_N s^{-1}

Number of defined particles, or elementary entities of a defined component, crossing a cross section divided by the time.

NOTES 1. Here, number flow rate is defined by analogy, see **mass flow rate** and **volume flow rate** (12).
2. The term **component** is recommended for clinical chemistry (2), ISO uses **substance**.

number of entities N 1

Number of molecules or other elementary entities in a system (12).

numerical value (of a quantity)

Quotient of the value of a quantity and the unit used in its expression (14).

NOTE See **value (of a quantity).**

ohm Ω

SI unit for electric resistance, equal to the electric resistance between two points of a conductor when a constant potential difference of 1 V, applied to these points, produces in the conductor a current of 1 A, the conductor not being the seat of any electromotive force (13).

NOTE $1\ \Omega = V\ A^{-1} = m^2\ kg\ s^{-3}\ A^{-2}$

optical density See **absorbance.**

NOTE Use of the term optical density to denote **absorbance** is deprecated by IUPAC.

osmolality m $mol\ kg^{-1}$

Quotient of the negative natural logarithm of the rational activity of water and the molar mass of water (4).

osmolarity See **osmotic concentration.**

osmotic coefficient ϕ 1

Quotient of the osmolality of a solute (component) and the sum of the molalities of all the solutes in the solution (4).

osmotic concentration c $mol\ m^{-3}$

Product of the osmolality and the mass density of water (4).

NOTES 1. Formerly called **osmolarity**.
2. The unit mole per litre is recommended for clinical chemistry (2).

osmotic pressure Π **Pa**

Pressure difference between the solution and the pure solvent which provides the same chemical potential of the solvent in the solution and in the pure solvent (4).

NOTE Also defined as the excess pressure required to maintain osmotic equilibrium between a solution and the pure solvent separated by a membrane permeable only to the solvent (12).

partial mass density ρ_B $kg\ m^{-3}$

Change in mass due to addition of a small amount of component to a system divided by the change in volume of the system (10).

NOTE The systematic name is partial volumic mass.

partial pressure p_B Pa

Product of the amount-of-substance fraction of a gaseous component and the pressure of the gaseous system (12).

partial specific volume v_B $m^3\ kg^{-1}$

Change in volume of a system when a small amount of component is added divided by the mass of thae added component (10).

NOTE The systematic name is partial massic volume.

partition coefficient See **distribution constant**.

pascal Pa

SI unit for pressure, equal to of one newton acting perpendicular to a surface of area per square metre (13).

NOTE $1\ Pa = 1\ N\ m^{-2} = 1\ kg\ m^{-1}\ s^{-2}$

period T s

A time divided by the number of regularly repeating events during that time (12).

NOTE It is the time taken to complete one cycle of a defined event.

peta P

Prefix used with SI units to denote 10^{15} (13).

pH

Quantity of dimension one used to express the hydrogen ion concentration of dilute aqueous solutions, where:

$pH \approx -\lg[\gamma_{\pm} c(H^+)/mol\ L^{-1}] \pm 0{,}02$ (11).

NOTES 1. $c(H^+)$ denotes the amount-of-substance concentration of hydrogen ion and $\gamma_{\pm}$ denotes the mean ionic activity coefficient of a typical uni-univalent electrolyte in the solution on a concentration of substance basis.

2. The definition applies when the substance concentation of the solution is less than 0,1 mol L^{-1}, and $2 < pH < 12$ (11).

pico p

Prefix used with SI units to denote 10^{-12} (13).

plane angle $\alpha, \beta, \gamma, \vartheta, \ldots$ rad

Ratio of the arc cut out in a circle with its centre at that point to the radius of the circle (12).

NOTES 1. 1 rad = 1 m m^{-1} = 1
2. See also **radian, degree, minute, second**.

poise P

Non SI unit for viscosity, equal to 0,1 Pa•s (13).

NOTE The poise is a unit of the CGS unit system, and its use is discouraged.

power P W

Rate of energy transfer (11).

NOTES 1. 1 W = 1 J s^{-1}
2. For an electric direct current, power is the product of current and potential difference, 1 W = 1 V A.

pressure p Pa

Force divided by the area over which the force is acting (12).

quantity

Attribute of a phenomenon, body or substance that may be distinguished qualitatively and determined quantitatively (14).

NOTES 1. The term quantity may refer to a quantity in a general sense, for example length, mass, or to a particular quantity, for example length of a particular rod, mass of a specified object.
2. The term **kind-of-quantity** refers to the abstract concept of a quantity common to a group of related quantities (2).

quantity of dimension one; dimensionless quantity

Quantity in the dimensional expression of which all the exponents of the dimensions of the base quantities are zero (14).

rad rad

Non SI unit for absorbed dose of ionizing radiation, equal to one centigray (13).

NOTE Approved by the CIPM for temporary use with the SI until considered no longer necessary.

radian rad

SI unit for plane angle, equal to the angle between two radii of a circle which cut off on the circumference an arc equal in length to the radius (13).

NOTES 1. 1 rad = 57,29578°.
2. The plane angle is a quantity of dimension one.

radiant energy Q J

Energy propagated as electromagnetic radiation (5).

radiant exitance M $W\ m^{-2}$

Radiant power emitted by an element of surface at uniform temperature divided by the surface area of that element (5).

radiant flux

See **radiant power**.

radiant power P W

Amount of radiant energy transferred to or from a defined system divided by the time interval (5).

NOTE Also called radiant (energy) flux.

radioactivity See **activity (radionuclide)**.

rate s^{-1}

Derived quantity in which time is a denominator quantity (7).

NOTE Rate of x is dx/dt.

rate coefficient k s^{-1}

Number fraction of particles of a component in a medium passing a given position in the direction of an applied force divided by time (10).

NOTE The applied force may be gravitational acceleration in column chromatography, rotational acceleration in centrifugation, electromotive force in electrophoresis.

rate constant k varies

Proportionality coefficient in a chemical reaction rate equation (11).

rate of conversion ξ mol s^{-1}

Change in the extent of a reaction over a time interval divided by that time interval (11).

NOTE See **extent of reaction**.

rate of reaction v mol m^{-3} s^{-1}

Rate of conversion of a (given) reaction divided by the volume of the system (11).

NOTE See **extent of reaction**.

ratio 1

Quotient of quantities of the same kind for different components within the same system (7).

reflectance ρ 1

Radiant power specularly reflected from the surfaces of a system divided by the incident radiant power (5).

NOTES 1. The quantity is also known as "specular reflectance" or "reflection factor".
2. In the absence of scattering and luminescence, the sum of the transmittance, absorptance and reflectance at given spectral position is equal to one.

refractive index n 1

Quotient of the speed in vacuum of electromagnetic radiation at a given spectral position and its speed in a given medium (5).

NOTE The medium must be non absorbing, i.e. not absorb the electromagnetic radiation at the spectral position.

relative

Quotient of quantities having the same kind-of-quantity in different systems (7).

NOTES 1. The denominator quantity is often called the reference quantity.
2. Preferentially the same component is found in the numerator and denominator quantity.

(relative) activity a 1

Number defined by $a_B = \exp(\mu_B - \mu_B^-/RT)$ when a component, B, is in a mixture of components (11), where:

μ_B = chemical potential of the component
μ_B^- = standard chemical potential of the component
R = molar gas constant
T = thermodynamic temperature

NOTES 1. The definition applies to specific entities (B) which should be specified as subscripts, i.e. λ_B,μ_B.
2. The term **component** is recommended for clinical chemistry (2), ISO uses the term **substance**.
3. See **relative activity**.

relative atomic mass A_r 1

Ratio of the average mass per atom of an element to 1/12 of the mass of an atom of nuclide ^{12}C (12).

NOTE Also known as **atomic weight**.

relative density d 1

Quotient of the density of a substance and the density of a reference substance under specified conditions (12).

NOTES 1. The systematic name is relative volumic mass.
2. The term specific gravity is not recommended.

relative molecular mass M_r 1

Ratio of the average mass per molecule of a compound to 1/12 of the mass of an atom of nuclide ^{12}C (12).

NOTE Also known as **molecular weight**.

rem rem

Non SI unit for dose equivalent, equal to one centisievert (13).

NOTES 1. Approved by the CIPM for temporary use with SI units until considered no longer necessary.
2. It is a special unit used to express dose equivalent in radioprotection.

repetency **See wavenumber**

resistance R Ω

Electric potential difference divided by the electric current when there is no electromotive force in a conductor (12).

resistivity ρ Ω m

Electric field strength divided by the current density when there is no electromotive force in a conductor (12).

revolutions per minute rpm

Non SI unit for rotational frequency (10).

NOTE See **rotational frequency**.

röntgen **R**

Non SI unit used to express exposure to ionizing radiation (13).

NOTES 1. Approved by the CIPM for continued use with SI units until considered no longer necessary.
2. $1\ R = 2{,}58 \bullet 10^{-4}\ C\ kg^{-1}$.

rotational frequency f_{rot} **Hz**

Number of rotations divided by time (10).

NOTES 1. The not recommended units revolutions per minute (rpm) and revolutions per second (rps) are usually used in specifications for rotationary equipment, for example centrifuges.
2. Not recommended synonyms are rate of rotation, rate of revolution, centrifugal speed, centrifugation speed.

saturation fraction s_B 1

Amount-of-substance of a component (solute) in a solution divided by the amount-of-substance of the component when it is saturating the system at constant temperature and pressure (4).

NOTE Also referred to simply as saturation, for example oxygen saturation.

second (of arc) "

Non SI unit for plane angle, equal to (π/648 000) rad (13).

NOTE Because of its importance and wide use, the CIPM approved use of the second (of arc) with SI units.

second (of time) s

Base unit of the SI for time, equal to the duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium-133 atom (13).

sedimentation coefficient s_B s

Reciprocal of the rate coefficient of a suspended component in a fluid passing a given position in the direction of gravitational or centrifugal acceleration (10).

NOTE 1. For clinical chemistry the term **component** is recommended (2), ISO uses **substance**.
2. Use of the Svedberg unit for this quantity is not recommended.

sedimentation velocity v_B $m\ s^{-1}$

Velocity of a component in a fluid relative to the fluid in the direction of gravitational or centrifugal acceleration (10).

NOTES 1. Also called sedimentation rate.
2. For clinical chemistry the term **component** is recommended (2), ISO uses **substance**.

siemens S

SI unit for electric conductance, equal to the conductance between two points of a conductor having a resistance of 1 Ω (13).

NOTE $1\ S = 1\ A\ V^{-1} = 1\ m^{-2}\ kg^{-1}\ s^3\ A^2$.

sievert Sv

SI unit for dose equivalent of absorbed radiant energy (13).

NOTES 1. The sievert is a special derived unit of the SI permitted by the CIPM for reasons of safeguarding human health.
2. $1\ Sv = 1\ J\ kg^{-1} = 1\ m^2\ s^{-2}$.

solid angle sr

Ratio of the area cut out on a spherical surface (with its centre at the apex of a cone) to the square of the radius of the sphere (12).

NOTE See also **steradian**.

specific

Modifier used to denote divided by mass (12).

EXAMPLES specific activity, specific heat.

NOTE Use of the term **massic** instead of specific is recommended (7), for example, massic activity, massic heat, etc.

specific activity a $Bq\ kg^{-1}$

Activity of a sample divided by its mass (12).

NOTES 1. The ISO definition is given for radionuclides with a unit $Bq\ kg^{-1}$.
2. For radionuclides, the systematic name is massic radioactivity.

specific conductance See **conductivity**.

specific heat capacity c $J\ kg^{-1}\ K^{-1}$

Heat capacity divided by mass (12).

NOTE See **heat capacity**.

specific volume v $m^3\ kg^{-1}$

Volume of a substance divided by its mass (12).

NOTES 1. It is the reciprocal of **mass density**.
2. A synonym is massic volume (7).

speed See **velocity**.

standard atmosphere See **atmosphere**.

steradian sr

SI unit for solid angle, equal to the solid angle extending from the centre of a sphere to span an area on its surface equal to the square of the radius (13).

NOTE The solid angle is a quantity of dimension one.

stokes St

Unit for kinematic viscosity in the CGS system of units (13).

NOTE 1. $1\ St = 1\ cm^2\ s^{-1} = 10^{-4}\ m^2\ s^{-1}$.
2. Use of the Stokes is not recommended with the SI (13).

stoichiometric number ν 1

Number or simple fraction for a substance (component) occurring in the expression for a chemical reaction (12).

NOTES 1. The stoichiometric number is negative for reactants and positive for products in the reaction equation (11).
2. For clinical chemistry the term **component** is recommended (2), ISO uses **substance**.

substance concentration c $\mathrm{mol\ m^{-3}}$

Amount-of-substance of a component divided by the volume of the system (2).

NOTES 1. The term **substance concentration** is recommended for clinical chemistry (2), IUPAC also uses **amount concentration** (11), and ISO uses **concentration**.
2. The term **component** is recommended for clinical chemistry (2), ISO uses **substance**.
3. The term **system** is recommended for clinical chemistry (2), ISO uses **mixture**.
4. The unit mole per litre is recommended for clinical chemistry (2).
5. Use of the term **molarity** for this quantity is not recommended.
6. Use of the term level as a synonym for concentration is deprecated.
7. In describing a quantity, **concentration** must be clearly differentiated from **content**.

substance content n/m $\mathrm{mol\ kg^{-1}}$

Amount-of-substance of a component divided by the mass of the system (2).

NOTES 1. The term **component** is recommended for clinical chemistry (2), ISO uses **substance**.
2. The term **system** is recommended for clinical chemistry (2), ISO uses **mixture**.
3. Use of the term level as a synonym for content is deprecated.
4. In describing a quantity, **content** must be clearly differentiated from **concentration**.

substance fraction x 1

Ratio of the amount-of-substance of the component to the total amount-of-substance in the system containing the component (2).

NOTES 1. The term **substance fraction** is recommended for clinical chemistry (2), IUPAC also uses mole fraction and amount fraction (11).
2. For clinical chemistry the term **component** is recommended (2), ISO uses **substance**.
3. For clinical chemistry the term **system** is recommended (2), ISO uses **mixture**.

substance flow rate $\mathrm{mol\ s^{-1}}$

Amount-of-substance of a component crossing a surface divided by the time (12).

NOTE For clinical chemistry the term **component** is recommended (2). ISO uses **substance**.

surface density ρ_S $\mathrm{kg\ m^{-2}}$

Mass divided by area (12).

NOTE The systematic name is areic mass.

surface tension γ $N\ m^{-1}$

Force perpendicular to a line element in a surface divided by the length of the line element (12).

symbol (in quantities and units)

Conventional sign designating a quantity or a unit of measurement (12).

NOTES 1. Symbols for quantities are denoted by letters of the Latin or Greek alphabet printed in italic (sloping) type; pH is an exception.
2. Symbols for units are denoted by letters of the Latin or Greek alphabet printed in roman (upright) type.

system

Arbitrarily defined part of the universe, regardless of form or size (1).

EXAMPLES patient, patient plasma, patient urine.

system of units (of measurement)

Set of base units, together with derived units, defined in accordance with given rules, for a given system of quantities (14).

EXAMPLE Système International d'Unités.

Système International d'Unités (SI)

Coherent system of units adopted and recommended by the Conférence Général de Poids et Mesures (CGPM) (14).

NOTE At present, the SI is based on the following seven base units (13):

the **metre**, unit of **length**
the **kilogram**, unit of **mass**
the **second**, unit of **time**
the **ampere**, unit of **electric current**
the **kelvin**, unit of **thermodynamic temperature**
the **mole**, unit of **amount-of-substance**
the **candela**, unit of **luminous intensity**

temperature See **thermodynamic temperature**.

tera T

Prefix used with SI units to denote 10^{12} (13).

thermochemical calorie cal_{th}

Non SI unit for energy, equal to 4,184 J (13).

NOTES 1. The thermochemical calorie is distinguished from the **international calorie** by use of the notation cal_{th}.
2. See **calorie**.
3. Use of the unit **thermochemical calorie** is deprecated by CIPM, ISO, IUPAC and IFCC.

thermodynamic temperature T K

Base quantity of the International System of Units (12).

NOTE See **Système International d'Unités**.

time t s

Base quantity of the International System of Units (12).

NOTE See **Système International d'Unités**.

torr torr

Non SI unit for pressure (11).

NOTES 1. 1 torr = 133,332 Pa.
2. Use of the unit **torr** is generally deprecated (13).

transmission See **transmittance**.

transmittance τ 1

Radiant power transmitted by a system in the direction of a parallel beam, divided by the incident radiant power (5).

NOTES 1. The symbol T may be used instead of τ.
2. The term transmission is used for this quantity but is not recommended.

true value (of a quantity)

Value consistent with the definition of a given particular quantity (14).

NOTES 1. The true value of a quantity is an ideal concept and, in general, cannot be known exactly.
2. It is a value that would be obtained by a perfect measurement.
3. The best approximation to the true value is obtained using a definitive measurement procedure.
4. See **conventional true value**

unified atomic mass unit u kg

Non SI unit for mass, equal to 1/12 of the rest mass of a neutral atom of the nuclide ^{12}C in its nuclear and atomic glound state (11).

NOTES 1. 1 u = 1,660 540 2(10)•10^{-27} kg (13).
2. Because of its importance ans use in specialized fields, the CIPM approved use of the unified atomic mass unit with SI units (13).
3. The unified atomic mass unit is also sometimes called the dalton, with symbol Da, althought the name and the symbol have not been approved by CIPM or ISO.

unit (of measurement)

Particular quantity, defined and adopted by convention, with which other quantities of the same kind are compared in order to express their magnitudes relative to that quantity (14).

value (of a quantity)

Magnitude of a particular quantity generally expressed as a unit of measurement multiplied by a number (14).

velocity v m s^{-1}

Distance travelled divided by time of travel (10).

viscosity; dynamic viscosity η Pa s

Constant of proportionality for shear stress, τ_{xz}, in a fluid moving with a velocity gradient dv_x/dz perpendicular to the plane of shear (10).

NOTE $\tau_{x,z} = \eta(dv_x/dz)$

volt V

SI unit for electric potential, equal to the potential difference between two points of a conducting wire carrying a constant current of 1 A, when the power dissipated between these points is equal to 1 W (13).

NOTE 1 V = 1 W A^{-1} = 1 m^2 kg s^{-3} A^{-1}.

volume V m^3

$V = \iiint dx\, dy\, dz$ (12).

NOTE In clinical chemistry the litre, symbol l or L, is the recommended unit for volume (2).

volume flow rate q_v m^3 s^{-1}

Volume of a component crossing a surface divided by the time (12).

NOTE For clinical chemistry the term **component** is recommended (2), ISO uses **substance**.

volume fraction ϕ 1

Quotient of the volume of a component and the total volume of the system containing the component (12).

NOTES 1. For clinical chemistry the term **component** is recommended (2), ISO uses **substance**.
2. For clinical chemistry the term **system** is recommended (2), ISO uses **mixture**.

volume rate See **clearance**.

volumic

Modifier used to denote divided by volume of the system (7).

volumic mass ρ $kg\ m^{-3}$

The volumic mass of a substance is its mass divided by its volume (7).

NOTES 1. See **density**.
2. For clinical chemistry the volume **litre** is recommended (2).

watt W

The watt is the SI unit for power, equal to the power which in 1 s give rise to energy of 1 J (13).

NOTE $1\ W = 1\ J\ s^{-1} = 1\ m^2\ kg\ s^{-3}$.

wavelength λ m

Distance in the direction of propagation of a regular wave divided by the number of cycles of the wave in that distance (5).

wavenumber (in a vacuum) ϑ m^{-1}

Number of cycles of a regular wave in a given distance divided by that distance (5).

NOTE The systematic name is **repetency.**

weber Wb

The weber is the SI unit for magnetic flux, equal to the magnetic flux which, linking a circuit of one turn, would produce in it an electromotive force of 1 V if it were reduced to zero at a uniform rate of 1 s (13).

NOTE $1\ Wb = 1\ V\ s = 1\ m^2\ kg\ s^{-2}\ A^{-1}$.

weight G N

Force which when applied to a body in a specified reference system would give it an acceleration equal to the local acceleration of free fall in that reference system (12).

NOTE The term **weight** is often used as a synonym for **mass**, but this usage is discouraged.

work W J

Force multiplied by the displacement in the direction of the force (12).

NOTE See also **joule**.

yocto y

Prefix used with the SI to denote 10^{-24} (13).

yotta Y

Prefix used with the SI to denote 10^{24} (13).

zepto z

Prefix used with the SI to denote 10^{-21} (13).

zeta potential See **electrokinetic potential**.

zetta Z

Prefix used with the SI to denote 10^{21} (13).

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