Cabinet Resolution No. (85) of 2023
Concerning the Technical Regulations for Legal Measurements Units

The Cabinet,

- Having reviewed the Constitution; and
- Based on the proposal submitted by the Minister of Industry and Advanced Technology, and the Cabinet's approval,

Has resolved as follows:

Article (1)
Definitions

In application of the provisions of this Resolution, the words and expressions set forth herein shall bear the meanings ascribed to them, unless the context otherwise requires:

Ministry	:	Ministry of Industry and Advanced Technology.
Minister	:	Minister of Industry and Advanced Technology.
Competent Authority	:	The federal and local government authority in the State that falls within its jurisdiction to implement any of the provisions of this Resolution.
Legal Measurement Units	:	Units of measurement that shall be used exclusively in the specific fields according to the legislation in force in the state.
Prefix	:	A letter or group of letters before a word that partly indicates meaning (such as Milli, kilo, mega).
Legal Measurement Instrument	:	A measuring instrument used in trading, or which, in some form or other, affects the health and safety of individuals or the environment as a result of not being given correct indicators.

General Conference on Weights and Measures	:	An intergovernmental organisation established in 1875 under the terms of the Metre Convention, through which member states work together on matters relating to metrology and measurement standards. It consists of delegates from the governments of member states and observers from affiliated countries.
International System of Units (SI)	:	An interconnected system of units based on the International System of Quantities, the names, symbols, and prefixes of its units, as well as rules for use thereof, have been approved by the General Conference on Weights and Measures.
Base Units	:	The legal measurement units approved by the General Conference on Weights and Measures, as units that are dimensionally independent of each other.
Derived Units	:	Legal measurement units established as products of powers of base units, in accordance with the algebraic relationships governing the associated quantities.

Article (2)

Scope of Application

1. The provisions of this resolution shall apply to legal units of measurement, symbols and prefixes thereof used in the following areas:
   a. Legal Measurement Instruments.
   b. Pre-packaged packages.
   c. Trading.
   d. Legal inspections and measurements.
   e. Health, Safety and Environment Fields.
   f. Advertisements, publications, books, magazines, and all advertising and media means.
   g. Contracts and official documents issued by public and private official entities.

2. The following areas shall be exempted from the use of legal measurement units, symbols and prefixes thereof:
    a. Conversion tables between different measurement units.
    b. Special uses related to military and security fields.
    c. Documents, contracts and properties in which international treaties and agreements binding on the State require the use of other measurement units.
    d. Goods and services related to export or documents and publications intended for use in other countries use different measurement units.
    e. Areas of scientific research.
    f. Any measurement units referred to for historical purposes.
    g. Special uses that require the use of non-legal measurement units (such as tire pressure gauges in psi and aviation inch length gauges) provided that they shall be determined with the legal equivalents thereof.

Article (3)

Responsibilities

The Ministry shall bear responsibility for implementing and supervising the requirements of this resolution in collaboration with the authorities authorised to carry out metrological control within the State, as well as with the competent authorities, scientific institutes, and universities. For this purpose, it may take the necessary decisions and procedures to ensure implementation thereof.

Article (4)

Legal Measurement Units

1. The legal measurement units adopted by the state and prefixes thereof consist of the following:
    a. The base units shown in Table (1) attached hereto.

b. Derived units, divided into the following groups:
    1. Derived measurement units based on the use of only the base units shown in Table (2) attached hereto.
    2. The measurement units with special names and symbols shown in Table (3) attached hereto.
    3. Derived measurement units whose names and symbols contain derived units with special names and symbols shown in Table (4) attached hereto.
    4. The non-dimensional derived measurement units shown in Table (5) attached hereto.
    5. Prefixes of measurement units shown in Table (6) attached hereto.

2. The legal measurement units accepted for use outside the International System of Units are as follows:
    a. The measurement units accepted due to the frequent use thereof, shown in Table (7) attached hereto.
    b. Acceptable measurement units, which are not permitted to be used outside the topics specified therefor, as shown in Table (8) attached hereto.
    c. The currently accepted units of measurement outside the SI within specific topics, the values of which have been determined by practical experience, and which shall be discontinued in the event of international adoption of alternative units for the fields included and shown in Table (9) attached hereto.
3. The measurement units listed in Table (10) attached hereto shall be discontinued, and any person who uses them shall be subject to the penalties prescribed in Article (6) of this resolution.
4. The use and notation of prefixes, symbols, quantities, units, and measurement results shall conform to the recommendations of the General Conference on Weights and Measures, as well as the mandatory technical regulations issued in this regard. They shall be presented in the correct form, size, and location, ensuring accuracy and preventing any errors or misleading representations

5. In educational contexts, reference may be made to certain measurement units outside the SI, whether historical or currently in use, for the purpose of understanding the evolution of the science of measurement.

Article (5)

Local Measurement Units

1. These are measurement units not recognised internationally, whose use is restricted to within the State for resolving local disputes, if they arise. Use thereof shall be exclusively verbal, and such units may possess different values and symbols outside the State.
2. It is prohibited to use the local units of measurement specified in Table (11) attached hereto. The units of measurement referred to shall be replaced according to the conversion factors mentioned in the same table.

Article (6)

General Provisions

1. To safeguard the public interest, the Ministry may take such actions as it deems appropriate in cases that cannot be addressed under the provisions of this Resolution, or in the event of a dispute regarding its interpretation or application. The Ministry may rely on prevailing international practices in this domain as a basis for the resolutions thereof.
2. The Minister shall have the authority to add or cancel any legal measurement units or to amend any of the tables attached hereto in response to scientific or technical developments, whether global or local, as required by the public interest.
3. In the event of a violation of the provisions of this resolution, the administrative penalties stipulated in Cabinet Resolution No. (64) of 2022 regarding the National Measurement System shall be applied.

Article (7)

Executive Resolutions

The Minister, in coordination with the competent authority, shall issue the Resolutions necessary to apply the provisions of this Resolution.

Article (8)

Repeals

Any provision that violates or contradicts the provisions of this Resolution shall be repealed.

Article (9)

Publication and Entry into Force

This Resolution shall be published in the Official Gazette and shall be enforced after (30) thirty days as of the date of its publication.

Mohammed Bin Rashid Al Maktoum

Prime Minister

Issued by Us:

Date: 02 Muharram 1445 A.H.

Corresponding to: 20 July 2023 AD

Schedule (1)

SI Base Units

Quantity: time Unit: The second Symbol: s	Quantity: time Unit: The second Symbol: s
It is defined by taking the fixed numerical value of the caesium frequency $\Delta\nu_{Cs,}$ the unperturbed ground-state hyperfine transition frequency of the caesium 133 atom, to be 9 192 631 770 when expressed in the unit Hz, which is equal to s^{-1}. This definition implies the exact relation $\Delta\nu_{Cs,} = 9\ 192\ 631\ 770$ Hz. Inverting this relation gives an expression for the unit second in terms of the defining constant $\Delta\nu_{Cs,}$:	The second is defined by taking a fixed numerical value of 9 192 631 770 Hz. The unperturbed ground-state hyperfine transition frequency of the caesium 133 atom $\Delta\nu_{Cs}$, where Hz = s^{-1}. This definition implies the following exact relation $\Delta\nu_{Cs,} = 9\ 192\ 631\ 770$ Hz. Inverting this relation gives an expression for the unit second in terms of the defining constant $Cs_{\Delta\nu,}$
$$1\ \text{Hz} = \frac{\Delta\nu Cs}{9\ 192\ 631\ 770}$$ **Or** $$1\ \text{Hz} = \frac{9\ 192\ 631\ 770}{\Delta\nu Cs}$$	**or**
The effect of this definition is that the second is equal to the duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the unperturbed ground state of the ^{133}Cs atom.	The effect of this definition is that the second is equal to the duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the unperturbed ground state of the 133 Cs atom.

The reference to an unperturbed atom is intended to make it clear that the definition of the SI second is based on an isolated caesium atom that is unperturbed by any external field, such as ambient black-body radiation.	The reference to an unperturbed atom is intended to make it clear that the definition of the SI second is based on an isolated caesium atom that is unperturbed by any external field, such as ambient black-body radiation.

Quantity: length Unit: The metre Symbol: M	Quantity: length Unit: The metre Symbol: M
It is defined by taking the fixed numerical value of the speed of light in vacuum *c* to be 299 792 458 when expressed in the unit m s^{-1}, where the second is defined in terms of $\Delta\nu_{Cs}$ This definition implies the exact relation c=299 792 458 m s^{-1} Inverting this relation gives an expression for the unit second in terms of the defining constant $\Delta\nu$Cs:	It is defined by taking the fixed numerical value of the speed of light in vacuum c to be 299 792 458 (299 792 458 m s^{-1}) where the second is defined in terms of $\Delta\nu_{Cs}$ This definition implies the exact relation c=299 792 458 m s^{-1} Inverting this relation gives an expression for the unit metre in terms of the defining constants c and$\Delta\nu$ CS:

$$1 \text{ m} = (\frac{C}{299\ 792\ 458})^{S}$$

$$= \frac{9\ 192\ 631\ 770}{299\ 792\ 458}\frac{C}{\Delta\nu Cs}$$

$$\approx 30.633\ 319\frac{C}{\Delta\nu Cs}$$

The effect of this definition is that one metre is the length of the path travelled by light in vacuum during a time interval with duration of 1/299 792 458 of a second.	The effect of this definition is that one metre is the length of the path travelled by light in vacuum during a time interval with duration of 1/299 792 458 of a second.

Quantity: Mass Unit: The kilogram Symbol: kg	Quantity: Mass Unit: The kilogram Symbol: kg
It is defined by taking the fixed numerical value of the Planck constant h to be 6.626 070 15 × 10^{-34} when expressed in the unit J s, which is equal to kg m^2 s^{-1}, where the metre and the second are defined in terms of c and $\Delta\nu_{Cs}$ This definition implies the exact relation h= 6.626 070 15 × 10^{-34} kg m^2 s^{-1} Inverting this relation gives an exact expression for the kilogram in terms of the three defining constants h, $\Delta\nu_{Cs}$ and c	It is defined by taking the fixed numerical value of the Planck constant h to be (6.626 070 15 × 10^{-34}), where (J s = kg m^2 s^{-1}), where the metre and the second are defined in terms of c and $\Delta\nu_{Cs}$ This definition implies the exact relation h= 6.626 070 15 × 10^{-34} kg m^2 s^{-1} Inverting this relation gives an expression for the unit kilograms in terms of the defining constants h, and $\Delta\nu$CS and c

$$1\ \text{Kg} = \left(\frac{H}{6.626\ 070\ 15 \times 10^{-34}}\right) m.^{-2}\ s$$

Which is equal to	Which is equal to

$$1\ \text{Kg} = \frac{(299\ 792\ 458)^2}{(6.626\ 070\ 15 \times 10^{-34})(9\ 192\ 631\ 770)} \frac{h\ \Delta\nu_{cs}}{C^2}$$

$$\approx 1.475\ 5214 \times 10^{40} \frac{h\ \Delta\nu_{cs}}{C^2}$$

The effect of this definition is to define the unit kg m^2 s^{-1} (the unit of both the physical quantities action and angular momentum). Together with the definitions of the second and the metre this leads to a definition of the unit of mass expressed in terms of the Planck constant h.	The effect of this definition is to define the unit (J s = kg m^2 s^{-1}) (The unit of physical quantities and angular momentum), which, together with the definitions of the second and the metre this leads to a definition of the unit of mass expressed in terms of the Planck constant h.

Quantity: electric current Unit: The ampere Symbol: A	Quantity: electric current Unit: The ampere Symbol: A
It is defined by taking the fixed numerical value of the elementary charge e to be 1.602 176 634 × 10^{-19} when expressed in the unit C, which is equal to A s, where the second is defined in terms of $\Delta\nu_{Cs}$ This definition implies the exact relation	It is defined by taking the fixed numerical value of the elementary charge e to be (1.602 176 634 × 10^{-19}) c، where C=A S, where the second is defined in terms of $\Delta\nu_{Cs}$ This definition implies the exact relation

$e = 1.602\ 176\ 634 \times 10^{-19}$ A s Inverting this relation gives an exact expression for the unit ampere in terms of the defining constants e and $\Delta\nu_{Cs}$:	$e = 1.602\ 176\ 634 \times 10^{-19}$ A s Inverting this relation gives an expression for the unit ampere in terms of the defining constants e and$\Delta\nu$CS:

$$1\ A = \left(\frac{e}{1.602\ 176\ 634\ \times 10^{-19}}\right) s^{-1}$$

Which is equal to	Which is equal to

$$1\ A = \frac{1}{(9\ 192\ 631\ 770)(1.602\ 176\ 634\ \times 10^{-19})} \Delta\nu_{cs} e$$

$$\approx 6.789.687\ \times\ 10^{8} \Delta\nu_{cs} e$$

The effect of this definition is that one ampere is the electric current corresponding to the flow of 1/(1.602 176 634 × 10^{-19}) elementary charges per second.	The effect of this definition is that one ampere is the electric current corresponding to the flow of 1/(1.602 176 634 × 10^{-19}) elementary charges per second.

Quantity: thermodynamic temperature Unit: The kelvin Symbol: K	Quantity: thermodynamic temperature Unit: The kelvin Symbol: K
It is defined by taking the fixed numerical value of the Boltzmann constant k to be 1.380 649 × $^{10-23}$ when expressed in the unit J K^{-1}, which is equal to kg m^2 s^{-2} K^{-1},	It is defined by taking the fixed numerical value of the Boltzmann constant k to be 1.380 649 × 10^{-23}, where J K^{-1} = Kg m^2 s^{-2} K^{-1}, where the

where the kilogram, metre and second are defined in terms of h, c and $\Delta\nu Cs$

This definition implies the exact relation

k=1.380 649 × 10^{-23} kg m^2 s^{-2} K^{-1}

Inverting this relation gives an exact expression for the kelvin in terms of the defining constants k, h and $\Delta\nu_{Cs}$

kilogram, metre and second are defined in terms of h, c and $\Delta\nu_{Cs}$

This definition implies the exact relation

k=1.380 649 × 10^{-23} kg m^2 s^{-2} K^{-1}

Inverting this relation gives an expression for the unit kelvin in terms of the defining constants k, h and $\Delta\nu CS$:

$$1\ K = \left(\frac{1.380\,649\ \times\ 10^{-23}}{k}\right)\ kg\ m^2 s^{-2}$$

Which is equal to

Which is equal to

$$1\ K = \frac{1.380\,649\ \times\ 10^{-23}}{(6.626\,070\,15\ \times\ 10^{-34})(9\,192\,631\,770)}\frac{\Delta\nu_{cs}h}{k}$$

$$\approx 2.266\,6653\ \frac{\Delta\nu_{cs}h}{k}$$

The effect of this definition is that one kelvin is equal to the change of thermodynamic temperature that results in a change of thermal energy kt by 1.380 649 × 10^{-23} j.

The effect of this definition is that one kelvin is equal to the change of thermodynamic temperature that results in a change of thermal energy kt by 1.380 649 × 10^{-23}

Quantity: amount of substance Unit: The mole Symbol: mol	Quantity: amount of substance Unit: The mole Symbol: mol
One mole contains exactly 6.02 214 076 × 10^{23} elementary entities. This number is the fixed numerical value of the Avogadro constant, N_A, when expressed in the unit mol^{-1} and is called the Avogadro number. The amount of substance, symbol n, of a system is a measure of the number of specified elementary entities. An elementary entity may be an atom, a molecule, an ion, an electron, any other particle or specified group of particles.	One mole contains exactly (6.02 214 076 X 10^{23}) elementary entities, this number is the fixed numerical value of the Avogadro constant, N_A , when expressed in the unit mol^{-1} (the inverse of the mole), and is called the Avogadro number. The amount of substance, symbol n, of a system is a measure of the number of specified elementary entities. is a measure of the number of specified elementary entities. An elementary entity may be an atom, a molecule, an ion, an electron, any other particle or specified group of particles.
This definition implies the exact relation $N_A = 6.022\ 140\ 76 \times 10^{23}\ mol^{-1}$ Inverting this relation gives an exact expression for the mole in terms of the defining constant N_A:	This definition implies the exact relation $N_A = 6.022\ 140\ 76 \times 10^{23}\ mol^{-1}$ Inverting this relation gives an exact expression for the mole in terms of the defining constant N_A

$$1\ mol = \frac{(6.022\ 140\ 76\ \times 10^{23})}{N_A}$$

The effect of this definition is that the mole is the amount of substance of a system that contains 6.02 214 076 × 10^{23} elementary entities.	The effect of this definition is that the mole is the amount of substance of a system that contains (6.02 214 076 X 10^{23}) elementary entities.

Quantity: luminous intensity Unit: The candela Symbol: cd	Quantity: luminous intensity Unit: The candela Symbol: cd
is the SI unit of luminous intensity in a given direction. It is defined by taking the fixed numerical value of the luminous efficacy of monochromatic radiation of frequency 540 × 10^{12} Hz, K_{cd}, to be 683 when expressed in the unit Im W^{-1}, which is equal to cd sr W^{-1}, or cd sr kg ^{1}m ^{2}s^{3}, where the kilogram, metre and second are defined in terms of h, cand $\Delta\nu_{Cs}$ This definition implies the exact relation K_{cd} = 683 cd sr kg ^{1}m ^{2}s^{3} for monochromatic radiation of frequency ν = 540 × 10^{12} Hz. Inverting this relation gives an exact expression for the candela in	It is defined by taking the fixed numerical value of the luminous efficacy (K_{cd}) of (683 lm W^{-1}) for a monochromatic beam with a frequency 540 x 10^{12} Hz, where Im W^{-1} =cd sr W^{1}=cd sr kg ^{1}m ^{2}s^{3} the kilogram, metre and second are defined in terms of -h, c and $\Delta\nu_{Cs}$ This definition implies the exact relation K_{cd} = 683 cd sr kg ^{1}m ^{2}s^{3} for monochromatic radiation of frequency ν = 540 × 10^{12} Hz

terms of the defining constants K_{cd} hand $\Delta\nu_{Cs}$

Inverting this relation gives an exact expression for the candela in terms of the defining constants K_{cd} and h and $\Delta\nu_{Cs}$

$$1\ cd = \left(\frac{k_{cd}}{683}\right) kg\ m^2 s^{-3} sr^{-1}$$

Which is equal to

Which is equal to

$$1\ cd = \frac{1}{(6.626\ 070\ 15\ \times\ 10^{-34})(9\ 192\ 631\ 770)^2\ 683} (\Delta\nu_{cs})^2 h\ K_{cd}$$

$$\approx 2.614\ 8305\ \times 10^{10} (\Delta\nu_{cs})^2 h\ K_{cd}$$

The effect of this definition is that one candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540 X 10^{12} Hz and has a radiant intensity in that direction of (1/683) W sr^{-1}.

The effect of this definition is that one candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540 X 10^{12} and has a radiant intensity in that direction of (1/683) W sr^{-1}

Table (2)

Examples of Some Derived Units Based on the Use of Base Units Only

Symbol		Unit		Quantity	
m^2	m^2	Square metre	Square metre	Area	Area
m^3	m^3	Cubic metre	Cubic meters	Volume	Volume
rad/s	rad/s	Radian per second	Radian per second	Angular velocity	Angular velocity
rad/s^2	rad/s^2	Radian per second squared	Radian per second squared	Angular acceleration	Angular acceleration
m/s	m/s	Metre per second	Metre per second	Velocity	Velocity
m/s^2	m/s^2	meter per second squared	Metre per second squared	Acceleration	Acceleration
kg/m	kg/m	Kilogram per metre	Kilogram per metre	Lineic mass, linear density	Lineic mass, linear density
kg/m^2	kg/m^2	Kilogram per square metre	Kilogram per square metre	Areic mass, surface density	Areic mass, surface density
kg/m^3	kg/m^3	Kilogram per cubic metre	Kilogram per cubic metre	Density (mass density)	Density (mass density)
m^2/s	m^2/s	Metre squared per second	Metre squared per second	Kinematic viscosity	Kinematic viscosity

m^3/s	m^3/s	Cubic metre per second	Cubic metre per second	Volume flow rate	Volume flow rate
kg/s	kg/s	Kilogram per second	Kilogram per second	Mass flow rate	Mass flow rate
A	A	ampere	ampere	Magnetomotive force	Magnetomotive force
A/m	A/m	Ampere per metre	Ampere per metre	Magnetic field strength	Magnetic field strength
Cd/m^2	cd/m^2	Candela per square metre	Candela per square metre	Luminance	Luminance
1/m	1/m	1 per metre	1 per meter	Wave number	Wave number

Table (3)

Derived Units with Special Names and Symbols

1	Quantity: Plane angle Unit: Radian Unit Symbol: rad A radian is the unit of plane angle, defined as the angle between two radii of a circle that intersect an arc whose length is equal to the radius of the circle.
2	Quantity: Solid angle Unit: Steradian Unit symbol: sr A steradian is the unit of solid angle, defined as the angle with its vertex at the centre of a sphere that intercepts an area on the surface of the sphere equal to that of a square whose side length is equal to the sphere radius.
3	Quantity: Frequency Unit: hertz Unit symbol: Hz Hertz is a unit of frequency, defined as the number of cycles of a periodic phenomenon occurring per second. Frequency is the number of cycles of a periodic phenomenon occurring in one second.
4	Quantity: Force Unit: Newton Unit Symbol: N A Newton is the force that, when applied to a stationary mass of 1 kilogram, causes it to accelerate at a rate of 1 metre per second squared.

5	Quantity: Pressure, stress Unit: Pascal Unit symbol: Pa A Pascal is a unit of pressure defined as the amount of uniform pressure that, when applied to a flat surface of 1 square meter, exerts a total force of 1 Newton perpendicular to that surface. It is also the uniform stress that, when applied to a flat surface with an area of 1 square meter, results in a total force of 1 Newton acting on that surface.
6	Quantity: Work, energy, quantity of heat Unit: joule Unit Symbol: J (1) A Joule is the work done when a force of 1 Newton moves an object a distance of 1 meter in the direction of the force.
7	Quantity: Energy flow rate, heat flow rate power Unit: watt Unit Symbol: W A Watt is the power that represents the rate at which 1 Joule of energy is produced or consumed per second.
8	Quantity: temperature, interval of temperature Unit: Degree Celsius Unit Symbol: °C (°) In addition to the thermodynamic temperature (K) expressed in Kelvin, the Celsius temperature (D) is also used, which is defined by the equation: D = KH - 273.15 The unit "degree Celsius" is numerically equivalent to the unit "kelvin"; however, "degree Celsius" is a specific name used instead of "kelvin."

	Temperature differences or ranges can be expressed either in degrees Celsius or in kelvins.
9	Quantity: Quantity of electricity, electric charge Unit: coulomb Unit Symbol: C A Coulomb is the quantity of electric charge transferred in 1 second by a constant electric current of 1 Ampere.
10	Quantity: Electric potential, electromotive force Unit: volt Unit Symbol: V A Volt is the electrical potential difference between two points in a conducting wire carrying a constant current of 1 Ampere, where the power consumed between these points is 1 Watt.
11	Quantity: Electric resistance Unit: ohm Unit Symbol: Ω An Ohm is the electrical resistance between two points of a conductor when a constant current of 1 Ampere flows through it, and the electrical potential difference between these points is 1 Volt, provided that the conductor is not connected to any source of electromotive force.

12	Quantity: Conductance Unit: siemens Unit Symbol: S A Siemens is the unit of electrical conductivity of a conductor that has an electrical resistance of 1 Ohm. (Electrical conductivity is the inverse of electrical resistance.)
13	Quantity: Electric capacitance Unit: farad Unit Symbol: F A Farad is the capacitance of an electrical capacitor that, when charged with an electric charge of 1 Coulomb, exhibits an electrical potential difference of 1 Volt between its plates.
14	Quantity: inductance Unit: Henry Unit Symbol: H A Henry is the unit of electrical inductance of a closed circuit that generates an electromotive force of 1 Volt when the electric current flowing through it changes at a constant rate of 1 Ampere per second.
15	Quantity: Magnetic flux Unit: weber Unit Symbol: Wb A Weber is the unit of magnetic flux that, when passing through a single-turn electric circuit, generates an electromotive force of 1 volt as the flux decreases to zero at a constant rate over one second.

16	Quantity: Magnetic flux density, magnetic induction Unit: Tesla Unit Symbol: T (1) A Tesla is the unit of magnetic flux density/effect produced in an area of 1 square metre by a uniform magnetic flux of 1 Weber perpendicular to the area.
17	Quantity: Catalytic activity Unit: katal Symbol: kat 1. It is the catalytic activity that causes a reaction rate change of mole of reactant per second. 2. When using the katal unit, it is recommended that the measured quantity be specified by linking it to the measurement method used to determine the reagent reaction. Note: According to Resolution No. 12 of the XXI General Conference on Weights and Measures in 1999, this derived unit can be used particularly in the fields of biochemistry and medical sciences.
18	Quantity: Luminous flux Unit: lumen Unit Symbol: lm A lumen is a measurement unit for luminous flux, defined as the amount of light emitted through a solid angle of 1 steradian from a light source with a uniform and precise radiation intensity of 1 candela.

19	Quantity: Illuminance Unit: lux Unit Symbol: lx Lux is a measurement unit for the illuminance of a surface, defined as the amount of luminous flux of 1 lumen uniformly distributed over an area of 1 square metre
20	Quantity: Activity of a radioactive source Unit: Becquerel Unit Symbol: Bq A becquerel is a measurement unit for the activity of a radioactive source, representing one spontaneous nuclear transformation, disintegration, or change in the number of radionuclides in a given energy state per second. The activity of a radioactive source is measured by the number of spontaneous nuclear transformations or decays, or the change in the number of radionuclides in a given energy state, occurring within one second.
21	Quantity: Absorbed dose, kerma Unit: gray Unit Symbol: Gy A Gray is a unit of measurement for the absorbed dose of ionising radiation, defined as the amount of energy of 1 Joule deposited in a substance with a mass of 1 kilogram.
22	Quantity: Dose equivalent Unit: sievert Unit Symbol: Sv A Sievert is a unit of measurement for the dose equivalent in biological tissue with a mass of 1 kilogram, which receives an energy of 1 Joule from ionising radiation with a radiation impact factor of 1, under constant radiation flux.

	In other words, a Sievert quantifies the biological damage caused to tissue due to exposure to ionising radiation and is equivalent to one Joule per kilogram. Note: The dose equivalent is defined as the product of the absorbed dose at a specific point in biological tissue and the radiation effect factor at that point.

Table (4)

Examples of Derived Units Whose Names and Symbols Contain Derived Units with Special Names and Symbols

Symbol		Unit		Quantity		No.
N.m	N.m	Newton metre	Newton metre	Moment of force	Moment of force	-1
Pa.s	Pa.s	Pascal Second	Pascal second	Dynamic viscosity	Dynamic viscosity	-2
J/K	J/K	Joule per kelvin	Joule per kelvin	Entropy	Entropy	-3
l/(kg⋅K)	l/(kg⋅K)	Joule per kilogram kelvin	Joule per kilogram kelvin	Specific heat capacity	Specific heat capacity	-4
W/(m.K)	W/(m.K)	Watt per metre kelvin	Watt per metre kelvin	Thermal conductivity	Thermal conductivity	-5
ν/m	ν/m	Volt per meter	Volt per metre	Electric field strength	Electric field strength	-6
W/sr	W/sr	Watt per steradian	Watt per steradian	Radiant intensity	Radiant intensity	
c/kg	c/kg	Coulomb per kilogram	Coulomb per kilogram	Exposure	Exposure	-8

Table (5)

Examples of Some Dimensionless Derived Units

No.	Unit	
-1	Refractive index	Refractive index
-2	Relative permeability	Relative permeability
-3	Friction factor	Friction factor
-4	Prandtl number	Prandtl number

Since the unit of dimensionless derived quantities is simply 1, it is not expressed explicitly. However, some of these dimensionless units have special names and symbols to avoid confusion with other derived units. Examples include the radian (rad), the steradian (sr), and the neper (Np).

Table (6)

SI Prefixes

Prefix Symbol		Prefix Name		Multiplication Factor	Value
Q	Q	quetta	quetta	10^{30}	1000 000 000 000 000 000 000 000 000 000
R	R	ronna	ronna	10^{27}	1 000 000 000 000 000 000 000 000 000
Y	Y	Yotta	Yotta	10^{24}	1 000 000 000 000 000 000 000 000
Z	Z	Zeta	Zeta	10^{21}	1 000 000 000 000 000 000 000
E	E	Exa	Exa	10^{18}	1000 000 000 000 000 000
P	P	Peta	Peta	10^{15}	1000000000 000 000
T	T	Tera	Tera	10^{12}	1000000000 000
G	G	Giga	Giga	10^{9}	1000000000
M	M	mega	mega	10^{6}	1000 000
K	K	Kilo	Kilo	10^{3}	1000
H	H	hecto	hecto	10^{2}	100
da	da	deca	deca	10^{1}	10
D	D	deci	deci	10^{1}	0.1
c	C	centi	centi	10^{-2}	0.01
M	M	milli	milli	10^{-3}	0.001
mc	μ	micro	micro	10^{-6}	0.000 001
n	n	nano	nano	10^{-9}	0.000 000 001
P	p	Pico	pico	10^{-12}	0.000 000 000 001
f	f	femto	femto	10^{-15}	0.000 000 000 000 001
a	a	atto	atto	10^{-18}	0.000 000 000 000 000 001
z	z	zepto	Zepto	10^{-21}	0.000 000 000 000 000 000 001

y	y	Yocto	Yocto	10^{-24}	0.000 000 000 000 000 000 000 001
r	R	ronto	Ronto	10^{-27}	0.000 000 000 000 000 000 000 000 001
q	Q	quecto	Quecto	10^{-30}	0.000 000 000 000 000 000 000 000 000

Table (7)

Acceptable Measurement Units Due to their Frequent Use

Quantity	Unit		Symbol		Value in international units
Time	Minute	minute	min	Min	1 min = 60s
	hour	hour	H	H	1h = 60 min = 3600 s
	One day	day	d	d	1d = 24 h
Plane Angle	Degree	Degree (1)	°	°	1° = (π/180) rad
	Minute	minute	′	′	1′= (1/60)′= (π/10 800) rad
	Second	Second	″	″	1″ - (1/60)″ = (π/648 000) rad
	gon (degree)	gon		gon	1° = (π/200) rad
Capacity	litre	litre (2)	L	L,l	1 l = 1 $dm^3 = 10^{-3} m^3$
Mass	Metric ton	ton (3)	Ton	t	1t = 10^3 kg
Pressure	bar	bar	bar	bar	1 bar = 10^5 Pa
Algorithmic quantity	Nipper (7) and (6)	neper	Np	Np	1Np = ln e = 1
	(8) bel	bel	B	B	1 B = (1/2) In 10 (Np) = lg 10 B

1. Standard no. 15031 recommends dividing the degree using decimals rather than using minutes and seconds.
2. This unit and symbol (1) were adopted by the CIPM in 1879. The alternative symbol (L) was adopted by the 16th General Conference on Weights and Measures in 1979, to remove confusion between the letter L and the number 1.
3. In some English-speaking countries this unit is called the "metric ton".
4. Example of algorithmic quantities: power level. power level

5. When using units of algorithmic quantities, the quantities being measured shall be stated.
6. Natural logarithms are used to obtain the algebraic value of quantities expressed in nipper.
7. The Niper unit is considered to be compatible with the SI but has not yet been adopted by the General Conference on Weights and Measures.
8. Decimal logarithm (logarithm to the base 10) is used to obtain the algebraic value of quantities expressed in Bel. The sub-multiple fraction decibel and the symbol (dB) are usually used.

Table (8)

Measurement Units Acceptable Outside the SI, which Shall Not be Used Outside the Topics for Which They are Specified

No.	Measured Quantity	Unit	Symbol	Value in international units	Special-use
1.	Area	barn	B	1 b = 10^{-28} m^2	Atoms and Nuclear Physics
.2	Dynamic viscosity Dynamic viscosity	poise poise	P	1 P = 0.1 Pa.s 1 cP = 10^{-3} Pa.s	
.3	Kinematic viscosity Kinematic viscosity	stokes stokes	St	1 St = 10^{-4} m^2/s 1 cSt = 10^{-6} m^2/s	
.4	Radioactive source activity	curie curie	Ci (9)	1 Ci = 37 GBq = 3.7 X 10^{10} Bq	
5.	Absorbed dose of radiation	rad	rad (10)	1 rad = 0.01 Gy = 10^{-2} Gy	Radiation
6.	Exposure to radiation Exposure	rdntgen	R (11)	1 R = 0.258 mC/Kg = 2.58 X 10^{-4} C/Kg	
7.	Pressure	Millimetre of mercury	mmHg	1 mmHg = 133.322 Pa	Only in specialised areas, such as:

9. This unit can be used with the prefixes for multiples and parts of units of measurement 12th CGPM, 1964

10. This unit can be used with the prefixes for multiples and parts of units of measurement 12th CGPM, 1964
11. This unit can be used with the prefixes for multiples and parts of units of measurement 12th CGPM, 1964

Low blood pressure measurement			Millimetre of mercury		
	1 bar =100 kPa = 10^5 Pa	bar (12)	bar		
	1 r = 2 πrad	r	cycle revolution	Plane Angle	8.
	1 diopter = 1 m^{-1}	diopter	diopter	strength of optical systems strength of optical Systems	
Pearls and precious stones trading	1 carat = $2x10^{-4}$ kg = 200 mg	Ct (13)	Metric carat Metric carat	Mass	10.
Sea and air travel	1 nautical mile = 1852 m	n mile	Nautical mile nautical mile	Height	11.
Sea and air travel	1 nautical mile per hour - (1852/3600) m/s	knot	knot knot	Velocity	12.

12. This unit can be used with the prefixes for multiples and parts of units of measurement 12th CGPM, 1964
13. The symbol ct has not been adopted by either the General Conference on Weights and Measures or ISO but is widely used.

Table (9)

Currently Accepted Units of Measurement Outside the International System of Units which Shall Be Discontinued

Special-use	Value in international units	Symbol	Unit	Measured Quantity	No., Item (14)
Magnetic wavelength	1 A = 0.1 nm= 10-10 m 1 in = 2.54 cm = 2.54 X 10^{-2} m	A IN	angstrom angstrom (15) inch inch	length	8.1
Timber trading	1 st = 1 m^3	St	Stere	Volume	8.2
	1 q = 100 kg = 10^2 Kg 1 lb= 453.592 g	Q Lb	quintal pound pound	Mass	B.3
	1 Kgf = 1 Kp = 9.806 65 N	Kgf kp	Kilogram-force kilopond	Force	d«
	1 atm = 101.325 kPa = 1.013 25X10^5 Pa	Atm	Standard atmospher	Pressure	8.5
	1 at = 98.0665 kPa = 0.980.665 X 10^5 Pa	At	technical atmospher		
Medical treatment	1Torr = 101.325/760 Pa	Torr	Torr		
	1 mH2O 9.806.65 kPa = 9.806.656 X 10^3 Pa	mH2o	Metre of water		
	1kgf.m = 1kp.m = 9.806.65 (16)	k.gfm	Kilogram Force-Meter		8.6

14. According to the document of the International Organisation for Legal Metrology OIML D2:1999:
15. According to reference (10), this unit can still be used.

	1 cal = 4.186.8	kp.m Cal	Kilogram force metre Kilopond metre Kilopond metre calorie calorie	Work, energy and heat	
	1 metric horsepower = 0.735.498.75 KW = 735.498.75 W	watt	metric horsepower (cheval-vapeur)	Power	8.7
	1 sb= 10 $K_{cd}/m^2 = 10^4$ cd/m^2	sb	stilb	Luminance	8.8

Table (10)

Units of Measurement Accepted in Specific Subjects and their Values Determined by Practical Experience

Quantity	Unit	Symbol		Definition	Value in international units
Energy	electronvolt electronvolt	eV	eV	It is the kinetic energy that an electron loses when it travels through a vacuum and is subjected to an electrical potential difference of 1 Volt.	1 eV = 1.602.177.33 X 10^{-19} ± 0.000 000 49 X 10^{-19}
Mass	Unified atomic mass unit Unified atomic mass unit	U	I.	It is a mass equal to 1/12 of the mass of the free carbon atom in the reference state.	1 u = 1.660.540.2 × 10^{-27} kg ± 0.000 001 0 × 10^{-27} kg
Height	Astronomical unit Astronomical unit	ua	ua	It is the average distance between the Earth and the Sun.	1 ua 1.495.978.706.91 x 10^{11} m ± 0.000 000 00030 × 10^{11} m

Table (11)

Table of Conversion Factors for Some Measurement Units that have been Cancelled

No.	Prohibited unit	Measurement Field	Alternative measure unit	Conversion Factor
.1	gallon	All fields	litre litre	1 Gallon - 4.546 litre
			Cubic metre cubic metre	1 Gallon - 4.546 X 10^{-3} m^3
.2	Foot	All fields	Metre metre	1 Foot = 0.304800 m
.3	war/yard	All fields	Metre metre	1 War (Yard) - 0.9144 m
.4	Tola	All fields	Gram gram	1 TOLA = 11.6638 g (Solid)
			millilitre millilitre	1 TOLA = 11.6638 ml (Liquid)