Outline of the metric system

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The following outline is provided as an overview of and topical guide to the metric system:

Metric system – various loosely related systems of measurement that trace their origin to the decimal system of measurement introduced in France during the French Revolution.

"The metric system is for all people for all time." (Condorcet 1791) Four objects used in making measurements in everyday situations that have metric calibrations are shown: a tape measure calibrated in centimetres, a thermometer calibrated in degrees Celsius, a kilogram mass, and an electrical multimeter which measures volts, amps and ohms.

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Nature of the metric system

The metric system can be described as all of the following:

- System – set of interacting or interdependent components forming an integrated whole.
  - System of measurement – set of units which can be used to specify anything which can be measured. Historically, systems of measurement were initially defined and regulated to support trade and internal commerce. Units were arbitrarily defined by fiat (see statutory law) by the ruling entities and were not necessarily well inter-related or self-consistent. When later analyzed and scientifically, some quantities were designated as fundamental units, meaning all other needed units of measure could be derived from them.

Essence of the metric system

- Introduction to the metric system
- International system of units (SI) is the system of units that has been officially endorsed under the Metre Convention since 1960. Child articles are:

- SI base units
- SI derived unit
- Non-SI units mentioned in the SI
- SI prefixes

Underlying philosophy

Discussions of the underlying philosophy of the metric system (and other systems of measure) include:

- Coherence (units of measurement)
- Realisation (metrology)

Metric units of measure

Articles that exist for many units of measure that are related to various flavours of the metric system are catalogued below. The codes in the various columns have the following meanings:

- **A** - Base unit
- **B** - Multiple or submultiple of a base unit
- **C** - Derived metric unit with a special name
- **D** - Derived coherent metric unit that has no special name
- **E** - Non-coherent unit explicitly permitted for use within the metric system (SI only)
- **F** - Unit of measure that has an association with the metric system
- **X** - No specified relationship (Other metric only)

Name	Quantity	SI unit	cgs unit	Other metric	Non-metric
Abampere	Electric current		C		
Abcoulomb	Electric charge		C		
Abhenry	Inductance		C		
Abohm	Electrical resistance		C		
Abvolt	Potential difference		C		
Ampere	Electric current	A			
Ampere-meter	magnetic pole strength.	D			
Apostilb	Luminance		C		
Astronomical unit	Length	E			
Dalton (Atomic mass unit)	Mass	E			
Barye	Pressure		C		
Becquerel	Radioactive activity	C			
Bril	Luminance				X
Candela per square metre	Luminance	D			
Candela	Luminous intensity	A			
Degree Celsius	Temperature	C			
Centimetre	Length	B	A		
Coulomb	Electric charge	C			
Cubic centimetre	Volume	D	D		
Cubic metre per second	Volumetric flow rate	D	D		
Cubic metre	Volume	D	D		
Curie	Radioactive activity		C		
Day	Time	E			
Decibel	logarithmic unit	E			
Degree of arc	Angle	E			
Dyne	Force		C		
Electronvolt	Energy	E			
Erg	Energy		C		
Farad	Capacitance	C			
Gal	Acceleration		C		
Gauss	Magnetic flux density		C		

Name	Quantity	SI unit	cgs unit	Other metric	Non-metric
Gram	Mass	B	A		
Grave (unit)	Mass			A	
Gray	Absorbed [radiation] dose	C			
Hectare	Area	E		B	
Henry	Inductance	C			
Hertz	Frequency	C	C		
Hour	Time	E			X
Joule per mole	Energy per Amount of substance	D			
Joule	Energy	C			
Joule-second	Angular momentum	D			
Katal	catalytic activity	C			
Kelvin	Temperature	A	A		
Kilogram per cubic metre	Density	D	D		
Kilogram	Mass	A	B		
Kilometres per hour	Velocity				X
Litre	Volume	E			
Lumen	Luminous flux	C			
Lumen second	Luminous energy	D			
Lux second	luminous exposure	D			
Lux	Illuminance	C			
Maxwell	Magnetic flux		C		
Metre per second squared	Acceleration	D	D		
Metre squared per second	Angular momentum	D	D		
Metre	Length	A	B		
Microgram	Mass	B	B		
Minute of arc	Angle	E			
Minute	Time	E			X
Mole	Amount of substance	A			
Neper	logarithmic unit for ratios	E			
Newton	Force	C			

Name	Quantity	SI unit	cgs unit	Other metric	Non-metric
Newton metre	Torque	D			
Newton-second	Impulse (physics) / Momentum	D			
Oersted	Magnetic field strength		C		
Ohm	Electric resistance	C			
Pascal	Pressure	C			
Phot	Illuminance		D		
Poise	Dynamic viscosity		C		
Radian per second	Angular frequency	D			
Radian	Angle	C			
Rayleigh	Photon flux			X	
Roentgen (unit)	kerma of X-rays and gamma rays		D		
Roentgen equivalent man	Radiation dose equivalent		D		
Second	Time	A	A		
Siemens	Electric conductance	C			
Sievert	Radiation dose equivalent	C			
Skot	Luminance			X	
Square kilometre	Area	D	D		
Square metre	Area	D	D		
Statcoulomb	Electric charge		C		
Statvolt	Potential difference		C		
Steradian	Solid angle	C			
Stilb (unit)	Luminance		D		
Torr	Pressure			X	
Stokes	Kinematic viscosity		C		
Tesla	Magnetic field strength	C			
Tonne	Mass	E			
Volt	Potential difference	C			
Watt second	Energy	D			
Watt	Power	C			
Weber	Magnetic flux	C			

History of the metric system

History of the metric system – the metric system developed from a decimal system of measurement adopted by France after the French Revolution.

Chronological history of the metric system

Principal dates in the development of the metric system include:[1]

- 1792 - Initiation of a decimal system of measurement by the French Revolutionary Government
- 1799 - The *Metre des archives* and *kilogram des archives* become the standards for the metric system.
- 1861 - Concept of unit coherence introduced by Maxwell - the base units were the centimetre, gram and second.
- 1875 - Under the Convention of the metre, a new body the General Conference on Weights and Measures (CGPM) was set up and given responsibility for the new international prototype kilogram and international prototype metre which replaced the old French copies as the definitive prototype metre and kilogram.
- 1881 - International Electric Congress agrees on standards for electrical units (formalised in 1893)
- 1921 - Convention of the metre extended to cover all physical units of measure
- 1960 - The CGPM published the metric system under the name "International System of Units" (SI) a coherent system of units based on the kilogram, metre, second, ampere and kelvin.

History of metrication

History of metrication – metrication is the process by which legacy, national-specific systems of measurement were replaced by the metric system.

- Metrication in Australia
- Metrication in Barbados
- Metrication in Canada
- Metrication in Chile
- Metrication in Guatemala
- Metrication in Hong Kong
- Metrication in India
- Metrication in Ireland
- Metrication in Jamaica
- Metrication in New Zealand
- Metrication in Peru
- Metrication in Sweden
- Metrication in the United Kingdom
    - Metrication of British Transport
    - British Metrication Board
- Metrication in the United States
    - Plan for Establishing Uniformity in the USA, Thomas Jefferson's report (1790) which included a proposal for decimal system based on a "decimal foot"
    - United States Metric Board

Historical metric system variants

Four variants of the metric system that predate the introduction of SI (1960) are described in varying levels of detail:

- MKS system of units formed the basis for SI.
- Centimetre–gram–second system of units was the principal variant of the metric system that evolved in stages until it was superseded by SI.
- Gravitational metric system was a little-used variant of the metric system that normalised the acceleration due to gravity.
- Metre–tonne–second system of units was a variant of the metric system used in French and Russian industry between the First and Second World Wars.

Between 1812 and 1839 France used a quasi-metric system:

- Mesures usuelles

History of metric units

- History of the metre

Politics of the metric system

Prior to 1875 the metric system was controlled by the French Government. In that year, seventeen nations signed the Metre Convention and the management and administration of the system passed into international control.

- Metre Convention describes the 1875 treaty and its development to the modern day. Three organisations, the CGPM, CIPM and BIPM were set up under the convention.
- General Conference on Weights and Measures (*Conférence générale des poids et mesures* or CGPM) – a meeting every four to six years of delegates from all member states.
- The International Committee for Weights and Measures (*Comité international des poids et mesures* or CIPM) – an advisory body to the CGPM consisting of prominent metrologists.
- The International Bureau of Weights and Measures (*Bureau international des poids et mesures* or BIPM) – an organisation based at Sèvres, France that has custody of the International Prototype Kilogram, provides metrology services for the GCPM and CIPM, houses the secretariat for these organisations and hosts their formal meetings.

Both the European Union and the International Organization for Standardization have issued directives/recommendations to harmonise the use of units of measure. These documents endorse the use of SI for most purposes.

- European units of measurement directives
- ISO/IEC 80000

Future of the metric system

- New SI definitions – changes in the metric system, or more specifically, the International system of units

that is expected to occur in 2018.

Metric system organizations

- U.S. Metric Association
- Metric Commission
- Metrication Board

Metric system publications

- *An Essay towards a Real Character and a Philosophical Language* Reproduction – 34.7 MB (http://www.metricationmatters.com/docs/WilkinsTranslationLong.pdf), Transcript 127 kB (http://www.metricationmatters.com/docs/WilkinsTranslationShort.pdf) (John Wilkins 1670)
- *Plan for Establishing Uniformity in the Coinage, Weights, and Measures of the United States* text (http://www.yale.edu/lawweb/avalon/jeffplan.htm) (Thomas Jefferson 1790)

Persons influential in the metric system

- Simon Stevin (1548-1620)
- John Wilkins (1614-1772)
- Gabriel Mouton (1618-1694)
- Marquis de Condorcet (1743-1794)
- Pierre Méchain (1744-1804)
- Pierre-Simon Laplace (1749-1827)
- Jean Baptiste Joseph Delambre (1749-1822)
- Adrien-Marie Legendre (1753-1834)
- James Clerk Maxwell (1831-1879)
- William Thomson, 1st Baron Kelvin (1824-1907)
- Giovanni Giorgi (1871-1950)

See also

- Imperial units

References

1. International Bureau of Weights and Measures (2006), *The International System of Units (SI)* (PDF) (8th ed.), pp. 108–110, ISBN 92-822-2213-6

External links

- Metric conversions (http://www.metric-conversions.org/)
- A chronological history of the modern metric system (http://www.metricationmatters.com/docs/MetricationTimeline.pdf)

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