

System International Units

The SI units (**System International Units**) have replaced the old system of reporting and measurements. This is in accordance with a World Health Organization resolution which recommends the adoption of the International System of Units by the medical community throughout the world. Consequently, reports and measurements from any corner of the world can be safely understood anywhere else.

The SI units is based on meter-kilogram-second system and replaces both the foot-pound-second system and the centimeter-gram-second system. There are seven SI base units, i.e. meter, kilogram, second, mole, ampere, Kelvin and Candela. The symbols of these units and what they measure are listed in the follow table:

SI base units			SI unit prefixes			
Symbol	Quantity measured		Prefix	Sym bol	Function	Divide by
Meter	m	length	deci	d	10^{-1}	10
Kilogram	kg	mass	centi	c	10^{-2}	100
Second	s	time	milli	m	10^{-3}	1000
Mole	mol	amount of substance	micro	μ	10^{-6}	1000000
Ampere	A	Electric current	nano	n	10^{-9}	1000000000
Kelvin	k	temperature	pico	p	10^{-12}	1000000000000
Candela	cd	Luminous intensity	femto	f	10^{-15}	1000000000000000
SI derived units			Multiply by			
Square meter	m^2	area	deca	da	10^1	10
Cubic meter	m^3	volume	hecto	h	10^2	100
Meter per second	m/s	speed	kilo	k	10^3	1000
			mega	M	10^6	1000000
			giga	G	10^9	1000000000
			tera	T	10^{12}	1000000000000
			peta	P	10^{15}	1000000000000000

Liter

The SI unit of volume is cubic meter (m^3). This is a very large unit, hence, the liter (L) although not an SI unit, has been recommended for use in the laboratory.

The liter is equal a cubic decimeter (1 dm^3). Volume measurements are made in liters or multiples and submultiples of the liter, e.g. dl (10^{-1} l), ml (10^{-3} l), μl (10^{-6} l).

One liter is, therefore, equivalent to 10 dl, 1000 ml or 1000000 μl . One dl is equivalent to 100 ml, and 1 ml to 1000 μl .

SI unit	Old unit
dl	100 ml
ml or cm^3	cc
μl	lambda
nl	-
pl	$\mu\mu\text{l}$

Gram

The kilogram (kg) is the SI unit for mass and the gram (gm) is the working unit.

Formerly, the gram (gm) was written as gramme, or gm. Mass measurements are made in grams or in multiples and submultiples of the gram, e.g. mg (10^{-3} gm), μg (10^{-6} gm), ng (10^{-9} gm), pg (10^{-12} gm).

One g is, therefore, equivalent to 1000 mg, 1000000 μg , or 1000000000 ng. One mg is equivalent to 1000 μg .

Mole (Mol)

The mole (mol) is the SI unit for amount of substance and measurements of the amounts of substances are made in moles, or in mmol (10^{-3} mol), μ mol (10^{-6} mol), or nmol (10^{-9} mol).

One mol is, therefore, equivalent to 1000 mmol, 1000000 μ mol, or 1000000000 nmol. One mmol/L is equivalent to 1000 μ mol/L.

Earlier, the results of tests expressed in mmol/L or μ mol/L were expressed in mg/100 ml or μ g/100ml. the formula used to convert mg/100 ml to mmol/L is as follows:

$$\text{mmol/L} = \frac{\text{mg/100ml} \times 10}{\text{molecular weight of substance}}$$

where the molecular weight of a substance cannot be accurately determined (e.g. albumin), results are expressed in gm/L.

SI unit	Old unit
mol	M
mmol	m Eq
μ mol	μ M
nmol	nM

International Unit (U)

This unit is used to express enzyme activity. **An International Unit of enzyme activity is that amount of enzyme which under defined assay conditions will catalyze the conversion of 1 μ mol of substrate per minute.** Results are expressed in International Units per liter (U/L).

Conversion Factor between Conventional and System International Units (SIU)

Enzyme

Conventional unit	IU/L
Acid phosphatase (prostatic)	5.37
Alkaline phosphatase	5.37
Aldolase	0.74
Amylase	1.85
Lactate dehydrogenase (LDH)	0.482
Lipase	278
Malic dehydrogenase (MD)	0.482

Hematology

Conversion factors				
Analyte	Conventional units	SI units	Conventional to SI units	SI to conventional units
WBC count (leucocytes)(B)	μl or/cu mm or/ mm^3	Cells $10^9/\text{L}$	0.001	1000
RBC count (erythrocytes)(B)	$10^6/\mu\text{l}$	$10^{12}/\text{L}$	1	1
Hematocrit [packed cell volume (PCV)]	%	Volume fraction	0.01	100
Mean corpuscular volume(MCV)	μ^3 (cubic microns)	fl	1	1
Mean corpuscular hemoglobin(MCH)	pg (or μg)	pg	1	1
Hemoglobin	gm/dl	gm/L	10	0.1
(whole blood)	gm/dl	mmol/L	0.155	6.45
(plasma)	mg/dl	$\mu\text{mol}/\text{L}$	0.155	6.45
Fibrinogen	mg/dl	gm/L	0.01	100

Chemistry

Conversion factors				
Analyte	Conventional units	SI units	Conventional to SI units	SI to conventional units
Albumin(S)	gm/dl	gm/L	10	0.1
Ammonia	µg/dl	µmol/L	0.714	1.4
Bilirubin	mg/dl	µmol/L	17.1	0.0584
Norepinephrine	µg/mg creatinine	µmol/mol	669	0.00149
Cholesterol	mg/dl	mmol/L	0.0259	38.61
Testosterone(total)(S)	ng/dl	nmol/L	0.0347	28.8
TSH	µU/ml	mIU/L	1	1
Thyroxin, total (T ₄)	µg/dl	nmol/L	12.9	0.0775
Triiodothyronine,total (T ₃)	ng/dl	nmol/L	0.0154	65.1