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Recommendations on measurement units – why and how

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On behalf of the IFCC-IUPAC Committee on Nomenclature for Properties and Units (C-NPU)

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ABSTRACT

Globally, laboratories are producing, communicating, and exchanging millions of laboratory examination values to multiple parties every day. For most values, 'measurement units' are required to make the numerical values comparable and meaningful. However, a non-systematic use of 'measurement units' can create errors in communication between health care providers and become a risk to patient safety. Therefore, the Committee of Nomenclature for Properties and Units (C-NPU) recommends using an unambiguous terminology of 'measurement units', for daily patient care and scientific publications. In this work, C-NPU summarizes the recommendations on 'measurement units', explaining the reasons and the principles of the 'measurement units' used in laboratory medicine.

INTRODUCTION

'Measurement unit' (unit) is a well-understood and necessary concept in laboratory medicine. Without units, most quantitative laboratory examination values will not make sense and are not comparable. Dybkær and Jørgensen wrote in 1967: "To state that the mass concentration of haemoglobin in a blood sample is 25 is essentially meaningless. If the unit g/L is assumed, the patient is considered anaemic. If the unit g/dL is assumed, the patient is considered to be polycytaemic" (1).

With the introduction of the International System of Units (SI units) (2) in the 1960's, the worldwide scientific laboratory societies have accepted and, to a large extent, implemented the SI units for presentation of laboratory reports in health care and research. However, as indicated by the recent campaign of the European Federation of Clinical Chemistry and laboratory Medicine (EFLM), there is nevertheless a further need of standardisation or harmonisation on a national, regional, and international level (3). The campaign recommended implementation of the "principles on units", proposed by Dybkær and Jørgensen in 1967 (1). These principles are more restricted than the original SI-system to ensure unambiguity in reporting, presenting, and exchanging quantity values in health care. Each laboratory may choose any relevant units for reporting laboratory examination values, but when multiple parties are involved in exchanging laboratory reports, the choice should be limited to the "principles on units". Arguably, the principles will reduce the risk of post-analytical errors, e.g. misunderstanding and misinterpretation of laboratory reports and errors in communication between different health care personnel and organisations.

The "principles on units" in laboratory medicine, as initially proposed by Dybkær and Jørgensen, have been implemented in the Nomenclature for Properties and Unit (NPU) terminology (4, 5).

In this letter, we summarise the IFCC's and IUPAC's Recommendations and Technical Reports on relevant principles and rules on units in laboratory medicine, and the reasons behind these principles.

KIND-OF-QUANTITY, QUANTITY, AND MEASUREMENT UNIT

In order to understand the concept 'measurement unit', it is necessary to see its close relation to the other essential metrological concepts 'kind-of-quantity' and 'quantity'. 'Mass', 'substance concentration', and 'volume fraction' are examples of 'kinds-of-quantity' that place system and any relevant component in a mathematical relation. E.g., 'substance concentration' is defined as "amount-of-substance of component B divided by volume of system 1" or:

$$\frac{\text{Amount-of-substance of component B}}{\text{Volume of system 1}}$$

On a more tangible level, the system and component can be specified further including a magnitude, e.g. :

$$\frac{\text{Amount-of-substance of sodium ion}}{\text{Volume of Mr. Smith's plasma}} = 140 \text{ mmol/L}$$

The latter example is a 'quantity', having the formal and metrological definition "property of phenomenon, body, or substance, where the property has a magnitude that can be expressed as a number and a reference" (6). The differences between both concepts are shown in Table 1.

In laboratory medicine, eight 'base kinds-of-quantity' exist as listed in Table 2 with their corresponding 'base units' and 'quantity dimensions' (5). The 'base kinds-of-quantity (e.g. 'amount-of-substance') can be combined in various ways, forming 'derived kinds-of-quantity', e.g. 'substance concentration'.

Table 1 Kind-of-quantity and quantity

Level	Concepts	Examples	
		Verbal expression	Mathematical expression
Abstract	kind-of-quantity	substance concentration	$\frac{\text{Amount-of-substance of component B}}{\text{Volume of system 1}}$
Measurable	quantity	substance concentration of sodium ion in Mr. Smith's plasma is 143 mmol/L at 2:30 p.m. on 2nd May 2018.	$\frac{\text{Amount-of-substance of sodium ion}}{\text{Volume of Mr. Smith's plasma}} = 143\ \text{mmol/L}$

In the example for 'quantity', 'plasma' is the 'system', 'sodium ion' is the 'component' and 'substance concentration' is the 'kind-of-quantity'. Also, there is a magnitude according to the definition of 'quantity', as compared with the example for 'kind-of-quantity' that does not have a magnitude.

To 'substance concentration', the corresponding compound unit can be, e.g., mmol/L. To a (base or derived) kind-of-quantity, several corresponding units are possible. Examples of corresponding units to 'substance concentration' are 'mol/L', 'mmol/L', 'µmol/L', 'nmol/L', etc. A comprehensive description of 'kinds-of-quantity' and 'measurement units' can be found in IFCC's and IUPAC's 'Silver Book' (5)–together with 'kind-of-nominal-property (related to 'nominal properties' which have no magnitude).

Reporting solely the numerical value and unit may not be sufficient information on the examination because the possible corresponding 'kind-of-quantity' to e.g., 'g/L', could be 'mass concentration' or mass density'. Moreover, in order for the clinicians to assess the values of laboratory examinations, especially laboratory examination reports from other laboratories, it is essential to provide information about the generic nature of the laboratory examinations. Thus, C-NPU recommends to report, systematically, the system, component, kind-of-quantity (or kind-of-nominal property) and, when relevant, the unit for a given laboratory examination.

GENERAL RULES FOR SI UNITS AND NON-SI UNITS

It is recommended to use units with unambiguous definitions, accepted by international scientific communities. Such units can be SI units and non-SI units.

1. Base SI units

The definitions, symbols, and magnitudes of SI units are traced to accepted international references (Table 2) (2).

Examples

"The metre is the length of the path travelled by light in vacuum during a time interval of 1/299 792 458 of a second" (2).

"The second is 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" (2).

Table 2 Base kinds-of-quantity, corresponding base units, and dimensions

Base kind-of-quantity	Base unit		Dimension
Term	Term	Symbol	Symbol
length	metre	m	L
mass	kilogram	kg	M
time	second	s	T
electrical current	ampere	A	I
thermodynamic temperature	kelvin	K	Θ
amount-of-substance	mole	mol	N
luminous intensity	candela	cd	J
number of entities	one	1	1

A list of base kinds-of-quantity and their corresponding base units and dimensions from IFCC's and IUPAC's 'Silver Book' (5). Note: 'Number of entities' is not an SI base kind-of-quantity but is used as a base kind-of-quantity in laboratory medicine.

Note: From the year 2019, all seven SI base units will be defined in terms of constants. The practical use of the seven SI base units will not change (7).

2. Unit of a given magnitude should have only one expression

For a unit with a given magnitude, there are several possible expressions, e.g.:

$$\frac{\text{mmol}}{\text{L}} = \frac{\mu\text{mol}}{\text{mL}} = \frac{\text{nmol}}{\mu\text{L}} = \frac{\text{pmol}}{\text{nL}}$$

Such variety may cause errors in communication between health personnel and organisations.

To ensure unambiguity in reporting values, only one expression for a unit of a given magnitude should be used.

3. Multiples and submultiples of units

To present numerical values in the interval of 0.1–999 (8) and to make values with very large or very small numerical values readable, the units can be combined with SI prefixes, expressed as either SI prefix symbols or SI prefix factors (numerical values) (Table 3).

To avoid errors in communication with potential patient mistreatments as consequences, multiple combinations of SI prefixes should not be allowed. Thus, the following rules apply:

- One SI prefix per unit
- The SI prefix belongs to the numerator only

Only one SI prefix per unit should be used. Combinations of SI prefixes are to be avoided (Table 4).

Table 3 SI prefixes: factors, terms, and symbols

Factor	Term	Symbol	Factor	Term	Symbol
10^{1}	deca	da	10^{-1}	deci	d
10^{2}	hecto	h	10^{-2}	centi	c
10^{3}	kilo	k	10^{-3}	milli	m
10^{6}	mega	M	10^{-6}	micro	µ
10^{9}	giga	G	10^{-9}	nano	n
10^{12}	tera	T	10^{-12}	pico	p
10^{15}	peta	P	10^{-15}	femto	f
10^{18}	exa	E	10^{-18}	atto	a
10^{21}	zetta	Z	10^{-21}	zepto	z
10^{24}	yotta	Y	10^{-24}	yocto	y

SI prefix table from the SI Brochure: The International System of Units (SI) [8th edition, 2006; updated in 2014] (BIPM) (2).

Table 4 Examples of one SI prefix per unit

Unit	Unit symbol	Examples of deprecated unit symbols	Examination example with correct unit
Picogram	pg	µµg 10^{-6}×µg	The mass of haemoglobin per erythrocyte in Mr. Smith's blood is 31 pg.
Millimole per litre	mmol/L	µmol/mL	The substance concentration of sodium in Mr. Smith's plasma is 134 mmol/L.

An SI prefix in the denominator should be avoided in a compound unit (Table 5).

An exception is that 'kilogram' (and not 'gram') is the base SI unit for mass and therefore can be expressed in the denominator as 'kg'.

4. Units for kinds-of-quantity of Dimension One (dimensionless)

Kind-of-quantity of Dimension One (dimensionless) is a "quantity for which all the exponents of the factors corresponding to the base

quantities in its quantity dimension are zero" (6). The 'base kind-of-quantity', 'number of entities' and kinds-of-quantity with the same 'kind-of-quantity' (dimension) in the numerator and denominator, e.g. 'mass fraction'

$$\frac{\text{Mass of component B}}{\text{Mass of system 1}}$$

or 'substance ratio'

$$\frac{\textit{Amount-of-substance of component B}}{\textit{Amount-of-substance of component C}}$$

have the dimension one, according to the rules of algebra. The corresponding coherent units for these kinds-of-quantity are numerical values, e.g., 'one' or SI prefix factors. The specified 'kind-of-quantity' along with the corresponding unit in the laboratory report provide the full nature of the quantity measured.

For the 'kinds-of-quantity' of Dimension One with the corresponding unit 'one', the unit symbol is often omitted for the values of these types (Table 6).

Table 5 Examples of SI prefix in the numerator

Unit	Unit symbol	Examples of deprecated symbols	Examination example with correct unit
Micromole per litre	µmol/L	nmol/mL	The substance concentration of bilirubins in Mr. Smith's plasma is 8 µmol/L.
Millimole per kilogram	mmol/kg	µmol/g	The mass of calprotectin in Mr. Smith's faeces is 8 mmol/kg.

Table 6 Examples of the unit 'one' for kinds-of-quantity of Dimension One

Unit	Unit symbol	Examples of deprecated symbols	Examination example with correct unit
One	1	-	The number of cavities in Mr. Smith's teeth is 2.
		kg/kg mg/mg	The mass fraction of free prostata specific antigen of total prostata specific antigen in Mr. Smith's plasma is 0.14.
		mol/mol mmol/mmol	The substance fraction of methaemoglobin of haemoglobin in Mr. Smith's blood is 0.03.
		L/L µL/µL	The volume fraction of erythrocytes of Mr. Smith's blood is 0.42.
		s/s min/min	The time of tissue factor-induced coagulation in Mr. Smith's plasma divided by the time of tissue factor-induced coagulation in the certified reference material, IRP 67/40, is 1.0 (INR).

To express very small or very large values, the units should be expressed as SI prefixes, according to the rules of multiples and submultiples of units. To avoid confusion with unit symbols, SI prefix factors should be used, not the SI prefix symbols (Table 7).

Consequently, redundant units are avoided because the same unit 'one' or SI prefix factors can represent units of various dimensionless kind-of-quantities and different expressions of a unit of a given magnitude (Table 6 and Table 8).

Another issue to address is conversion of unit from 'one' to '%' for a kind-of-quantity of dimension 'one', e.g. erythrocyte volume fraction (EVF). EVF can be expressed with 'one' or '%' as units, whereas 'one' is usually omitted. Without the indication of unit, it may be tempted to convert from 'one' to '%'. Values of erythrocyte volume fraction (EVF) will be reported either as "0.42" or "42". Despite the small and simple conversion from 'one' to '%' the laboratory report with both type of results

Table 7 Examples of SI prefix factors as units for kinds-of-quantity of Dimension One

Unit	Unit symbol	Examples of deprecated symbols	Examination example with correct unit
Ten to the power of 6 per litre	10^6/L	M/L* M×1/L	The number concentration of lymphocytes in Mr. Smith's cerebrospinal fluid is 8×10^6/L.
Ten to the power of -3 per litre	10^{-3}/L	m/L** m×1/L	The number concentration of RNA from Human immunodeficiency virus 1 in Mr. Smith's plasma is 0×10^{-3}/L.

** 'M' is the SI prefix symbols for 'mega'; ** 'm' is the SI prefix symbols for 'milli'.*

Table 8 Examples of SI prefix factor representing various units

Unit	Unit symbol	Examples of deprecated symbols	Examination example with correct unit
Ten to the power of -3	10^{-3}	g/kg	The mass fraction of ethanol of Mr. Smith's blood is 0.5×10^{-3}.
		mmol/mol	The substance ratio of albumin/creatininium in Mr. Smith's urine is 25×10^{-3}. (The albumin value is adjusted to the amount-of-substance of creatininium in urine).
		$\frac{1\ reticulocyte}{1000\ erythrocytes}$	The number fraction of reticulocytes of erythrocytes in Mr. Smith's blood is 10×10^{-3}.

will cause confusion, if not interpreted by a conscious human mind.

5. Units for quantities of the same sort of system, sort of component(s), and kind-of-quantity should differ at least by a factor of one thousand

A laboratory examination of a quantity with a given sort of system, sort of component(s), and kind-of-quantity can be reported with different corresponding units, according to the choice of the local laboratories. To reduce misinterpretations that may occur when exchanging laboratory results between hospitals or when health personnel change hospitals, it is recommended that the laboratories use units that differ by at least a prefix factor of one thousand (10^3) for the same type of examination performed in 2 or more laboratories.

E.g. Laboratory A measures the substance concentration of epinephrine in plasma with the unit, 'µmol/L'. Laboratory B performs the same type of measurement but present the value with a unit that differs at least by a prefix factor of one thousand. In this case Laboratory B uses the unit, 'nmol/L'.

Example

NPU14042 Plasma—Epinephrine; substance concentration = ? µmol/L

NPU04625 Plasma—Epinephrine; substance concentration = ? nmol/L

This recommendation is to prevent overlapping intervals of value sets for a specific laboratory examination. Often, value sets vary for the same laboratory examination using different units, but these variations may overlap when the units differ by a factor of 10 or 100, e.g. 'cm' and 'mm', '%' and '‰', or 'dL' and 'L'. The overlaps can cause misinterpretation, when the clinicians incorrectly assume use of the unit they are familiar with for a result from another laboratory (see example below). Thus, the use of SI prefix factors: centi (c), deci (d), deca (da) and hecto (h) are discouraged, except when the units are lifted to a power (see section 7.3).

Example

Laboratories A and B (in Hospitals A and B, respectively) measure number fraction of the reticulocytes among erythrocytes in Mr. Smith's blood with the use of two different units. The units differ by a factor of 10 (see below laboratory reports from laboratories A and B).

The patient is regularly admitted to Hospital B, but due to practical difficulties, a blood sample from the patient is analysed by Laboratory A in the patient's hometown. The health care personnel at hospital B may not react adequately on the value '1' from laboratory A on 24th January, because the value lies in a familiar value set interval and could mistakenly be interpreted to be within Laboratory B's reference interval (Table 9).

Table 9 Example of a cumulative laboratory report from two different laboratories

Laboratory examination	12th Jan	20th Jan	24th Jan	Reference interval	Unit
Erythrocytes (Blood)—Reticulocytes; number fraction*	-	-	1	5–22	$\times 10^{-3}$
Erythrocytes (Blood)—Reticulocytes; number fraction**	1	0.8	-	0.5–2.2	$\times 10^{-2}$

** Examination result from Lab A.; ** Examination result from Lab B.*

6. Non-SI units

Besides the non-SI units accepted for use together with the SI system, e.g., litre, (Table 10), there are two important internationally used expressions for non-SI units in laboratory medicine: 'WHO International Unit' (IU) and '(procedure defined unit)' (p.d.u.).

6.1 WHO International Unit (IU)

The term 'WHO International Unit' (IU) does not indicate one unit but comprises a heterogeneous group of units, each defined by internationally certified reference material (CRM), (e.g. a WHO International Standard). Thus, the given CRM defines the material and magnitude of the

Table 10 Non-SI units accepted for use with the International System of Units

Term	Symbol
litre	L
tonne	t
day	d
hour	h
minute	min
Dalton	Da

An extract of a list of accepted non-SI units from BIPM (2).

Table 11 Examples of use of SI prefix for 'International Unit' and 'enzyme unit'

Unit	Unit symbol	Examples of deprecated symbols	Examination example with correct unit
10^3 International Unit per litre	$\times 10^3$ IU/L	kIU/L	The arbitrary substance concentration of Birch -IgE in Mr. Smith's plasma is 10×10^3/L.
10^{-3} International Unit per litre	$\times 10^{-3}$ IU/L	mIU/L	The arbitrary number concentration of RNA from Hepatitis C virus in Mr. Smith's plasma is 200×10^{-3} IU/L.
10^{-3} enzyme unit per litre	mU/L	$\times 10^{-3}$ U/L	The catalytic-activity concentration of guanosine deaminase in Mr. Smith's plasma is 250 mU/L.
10^3 enzyme unit per litre	kU/L'	$\times 10^3$ U/L	The catalytic-activity concentration of pancreatic amylase in Mr. Smith's duodenal fluid is 40×10^3 U/L.

unit. 'IU' should not be confused with the symbol for enzyme unit 'U' that is defined as 'µmol per minute' (5).

A current CRM may not be permanent for a specific measurand, and the magnitude of the unit may be redefined by a new CRM batch (see examples below). To distinguish between different IUs, the given CRM should be stated in the examination report.

In the NPU terminology, the specific CRM is a part of the laboratory examination code (in the examples below 'IS 09/172' and 'IS 84/665' are specific CRMs).

Examples

NPU58076 Plasma—Coagulation factor IX; arbitrary substance concentration (enzymatic; IS 09/172; procedure) = ? IU/L

NPU01636 Plasma—Coagulation factor IX; arbitrary substance concentration (enzymatic; IS 84/665; procedure) = ? IU/L

Note: The modifier 'arbitrary' is ambiguous. Sometimes it is used for 'random'. This is not the case here. An 'arbitrary substance concentration' is a substance concentration decided and defined by an 'arbiter'. In this case 'WHO' is the 'arbiter'.

The use of SI prefix factors is allowed in descriptions of very small or very large values, because the international CRM has a well-defined magnitude. However, SI prefixes are not recommended in combination with IU expressions due to confusion with the symbol for the 'enzyme unit', U (Table 11). E.g. 'kU/L' can be mistaken for 'kIU/L', and 'mU/L' for 'mIU/L'.

6.2 Procedure defined unit (p.d.u.)

If the unit is defined by a measurement procedure that is not traceable to an international unit or an international CRM, the laboratory must describe and term the unit used. Such units are frequently termed 'arbitrary unit', 'arbitrary unit/L', 'ELISA unit', etc. — without any indication of either dimension or magnitude.

The NPU terminology uses the term '(procedure defined unit)', symbolized '(p.d.u.)', to indicate that the NPU terminology does not specify the unit for the kind-of-quantity in question. Although it may appear to be a well-defined unit, the concept contains a heterogeneous group of arbitrary and proprietary units.

It reflects the disagreement of the unit magnitudes between different assays and no common CRM.

The actual magnitude of the unit depends on the analytical measurement procedure, and it is the responsibility of the laboratory to communicate the required information for clinical evaluation of the laboratory reports.

Thus, the '(procedure defined unit)' is a simple placeholder for the units that one or more laboratories have termed and described.

Local symbols for these non-SI units should not look like SI-units, such as 'mg/L', to prevent misunderstanding of laboratory values.

Example

NPU29718 Plasma—3-hydroxy-3-methylglutaryl-coenzyme A reductase antibody (IgG); arbitrary substance concentration (procedure) = ? (procedure defined unit)

In this case, the local term for the '(procedure defined unit)' could be, e.g., 'arbitrary unit/L'.

Combinations of the term '(p.d.u.)' with SI prefixes and/or SI- or non-SI units are meaningless, as they may represent units of any magnitude and dimension (Table 12).

Comparisons on a national or regional level require harmonisation and pre-coordination for the laboratory examinations using '(p.d.u.)' as unit.

Table 12 Examples of use of procedure defined unit

Unit	Unit symbol	Examples of deprecated symbols	Examination example
Procedure defined unit	(p.d.u.)	(p.d.u.)/kg	The arbitrary substance content of haemoglobin in Mr. Smith's faeces is 20 ELISA unit/kg.
		m(p.d.u.)	
		10^{-3}× (p.d.u.)	

7. Exceptions

Units that violate some of the above rules may exceptionally be accepted as follows.

7.1 International recommendation on specific units

Well-defined and unambiguous units that violate the above stated rules may be acceptable for use if an international recommendation has been established.

Example

'Millimole per mole' ('mmol/mol') was recommended by IFCC for the laboratory examination of 'HbA_{1C}' (9).

7.2 Per cent

Many kinds-of-quantity defined as fractions are by convention and very long tradition expressed with the unit 'per cent' ('%' or '10^{-2}'), however, it is recommended to use caution when using this unit due to the high risk of errors in communication between health personnel, as explained in section 5. Therefore, if there is a strong international need of using '%' as unit for a specific laboratory examination, an international recommendation needs to be established for that specific laboratory examination.

Example

'Per cent' was recommended by IFCC for the laboratory examination 'carbohydrate-deficient transferrin (CDT)' (10).

NPU57406 Transferrin (Plasma)—Disialotransferrin; substance fraction (IFCC 2016) = ? %

Consequently, for the NPU terminology, NPU codes for that laboratory examination, using 'one' or '10^{-3}' as units, cannot be established due to risk of misinterpretation of exchanged laboratory results. This will ensure that only '%' will be reported in any laboratory.

7.3 Units lifted to a power

For units lifted to a power, e.g. 'cm^2' and 'm^3', the SI prefixes with a factor less than 1000 are acceptable for a laboratory examination with the same system, component, and kind-of-quantity. E.g. 'mm^2', 'cm^2', 'dm^2' and 'm^2' are acceptable, because they ensure steps of at least a factor of 100 between the numerical values.

The intervals of the value sets for these units are not overlapping, and there is no increased risk of misinterpretation in exchanging laboratory reports.

Examples

Patient—Body Surface; area = 1.8 m^2

Patient—Body Surface; area = 180 dm^2

Patient—Body Surface; area = 18 000 cm^2

Patient—Body Surface; area = 1 800 000 mm^2

Note: The two bottom entries should for readability purposes not be established (see Section 3: Multiples and submultiples of units).

CONCLUSION

Globally, millions of laboratory examinations are performed, communicated, exchanged, and presented every day. Moreover, as patients (and health care personnel) are traveling between hospitals and other health care organisations, patient health data are communicated between these organisations as well.

The risk of post-analytical misinterpretations – especially of the exchanged laboratory data – is, thus, high and may induce errors in patient care. To reduce risk and support optimal interoperability, the reviewed principles on measurement units are recommended for use by all parties in health care IT systems and organisations, and in scientific publications in the field of health care.

To illustrate our recommendations regarding measurement units, we provide a list of two hundred frequent laboratory examinations with units as used in Danish, Dutch, Norwegian, and Swedish laboratories. See Supplement to 'measurement units' (in Table 13, after the References section).

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In memory of Rene Dybkær and his tremendous contribution to laboratory medicine.

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Vocabulary

component: *part of a system (5)*

kind-of-nominal-property: *defining aspect, common to mutually comparable nominal properties (11)*

kind-of-quantity: *aspect common to mutually comparable quantities (6)*

nominal property: *property of a phenomenon, body, or substance, where the property has no size (11)*

numerical quantity value: *(numerical value, value): number in the expression of a quantity value, other than any number serving as the reference (6)*

ordinal kind-of-quantity: *quantity, defined by a conventional measurement procedure, for which a total ordering relation can be established, according to magnitude, with other quantities of the same kind, but for which no algebraic operations among those quantities exist (6)*

quantity value: *number and reference together expressing magnitude of a quantity (6)*

system: *part or phenomenon of the perceivable or conceivable world consisting of a demarcated arrangement of a set of elements and a set of relations or processes between these elements (5)*

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REFERENCES

1. Dybkær R, Jørgensen K. Quantities and Units in Clinical Chemistry -Including Recommendation 1966 of the Comision on Clinical Chemistry of the International Union of Pure and Applied Chemistry and of the International Federation for Clinical Chemistry. Copenhagen: Munksgaard; 1967. 102 p.

2. Mesures BIdPe. SI Brochure: The International System of Units (SI). In: Mesures BIdPe, editor. 8th edition ed. https://www.bipm.org2014.

3. Ceriotti F. EFLM campaign for the harmonization of the units of measurement2016:[2 p.]. Available from: http://www.ifcc.org/ifcc-communications-publications-division-(cpd)/ifcc-publications/enewsletter/.

4. Magdal U, Dybkaer R, Olesen H. Properties and units in the clinical laboratory sciences, Part XXIII. The NPU terminology, principles and implementation -a user's guide (Technical Report 2011) (IFCC-IUPAC). Clin Chem Lab Med. 2012;50(1):35-50.

5. Férard G, Dybkaer R, Fuentes-Arderiu X. Compendium of Terminology and Nomenclature of Properties in Clinical Laboratory Sciences : Recommendations 2016. 1 ed: Royal Society of Chemistry; 2017. 182 p.

6. Mesures BIdPe. International Vocabulary of Metrology – Basic and General Concepts and Associated Terms VIM 3rd edition JCGM 200:2012 (JCGM 200:2008 with minor corrections). https://www.bipm.org: Bureau International des Poids et Mesures; 2008.

7. Gibney E. New definitions of scientific units are on the horizon. Nature. 2017;550(7676):312-3.

8. Standardization ECf. Health informatics. Expression of results of measurements in health sciences. EN 12435:2006. p. 120.

9. International Federation Of Clinical Chemistry and Laboratory Medicine ISD, Nordin G, Dybkaer R. Recommendation for term and measurement unit for "HbA1c". Clin Chem Lab Med. 2007;45(8):1081-2.

10. Schellenberg F, Wielders J, Anton R, Bianchi V, Deenmamode J, Weykamp C, et al. IFCC approved HPLC reference measurement procedure for the alcohol consumption biomarker carbohydrate-deficient transferrin (CDT): Its validation and use. Clin Chim Acta. 2017;465:91-100.

11. Nordin G, Dybkaer R, Forsum U, Fuentes-Arderiu X, Pontet F. Vocabulary on nominal property, examination, and related concepts for clinical laboratory sciences (IFCC-IUPAC Recommendations 2017). Pure and Applied Chemistry. 2017:23.

Table 13 Supplement to 'measurement units'

Rank (see commentary)	*Non-authorized indications (trivial terms and abbreviations)	**NPU identifier	Comprehensive, systematic NPU term of laboratory examinations	Abbreviated NPU term of laboratory examinations	System	Sys-spec.	Prefix	Component	Comp-spec.	Kind-of-property"	Procedure	Unit	Speciality	Scale type
1		NPU03230	Plasma—Potassium ion; substance concentration = ? mmol/L	P—Potassium ion; subst.c. = ? mmol/L	Plasma			Potassium ion		substance concentration		mmol/L	Clinical Biochemistry	Ratio
2		NPU28309	Blood—Haemoglobin; mass concentration = ? g/L	B—Haemoglobin; mass c. = ? g/L	Blood			Haemoglobin		mass concentration		g/L	Clinical Biochemistry	Ratio
3		NPU02319	Blood—Haemoglobin(Fe); substance concentration = ? mmol/L	B—Haemoglobin(Fe); subst.c. = ? mmol/L	Blood			Haemoglobin	Fe	substance concentration		mmol/L	Clinical Biochemistry	Ratio
4		NPU03429	Plasma—Sodium ion; substance concentration = ? mmol/L	P—Sodium ion; subst.c. = ? mmol/L	Plasma			Sodium ion		substance concentration		mmol/L	Clinical Biochemistry	Ratio
5		NPU02593	Blood—Leukocytes; number concentration = ? × 109/L	B—Leukocytes; num.c. = ? × 10⁹/L	Blood			Leukocytes		number concentration		× 109/L	Clinical Biochemistry	Ratio
6	ALAT	NPU19651	Plasma—Alanine transaminase; catalytic concentration(IFCC 2002) = ? U/L	P—Alanine transaminase; cat.c.(IFCC 2002) = ? U/L	Plasma			Alanine transaminase		catalytic concentration	IFCC 2002	U/L	Clinical Biochemistry	Ratio
7	CRP	NPU19748	Plasma—C-reactive protein; mass concentration = ? mg/L	P—C-reactive protein; mass c. = ? mg/L	Plasma			C-reactive protein		mass concentration		mg/L	Clinical Biochemistry	Ratio
8	Platelets	NPU03568	Blood—Thrombocytes; number concentration = ? × 109/L	B—Thrombocytes; num.c. = ? × 10⁹/L	Blood			Thrombocytes		number concentration		× 109/L	Clinical Biochemistry	Ratio
9		NPU18016	Plasma—Creatininium; substance concentration = ? µmol/L	P—Creatininium; subst.c. = ? µmol/L	Plasma			Creatininium		substance concentration		µmol/L	Clinical Biochemistry	Ratio
10	ALP	NPU27783	Plasma—Alkaline phosphatase; catalytic concentration(37 °C; procedure) = ? U/L	P—Alkaline phosphatase; cat.c.(37 °C; proc.) = ? U/L	Plasma			Alkaline phosphatase		catalytic concentration	37 °C; procedure	U/L	Clinical Biochemistry	Ratio
11		NPU19673	Plasma—Albumin; mass concentration(procedure) = ? g/L	P—Albumin; mass c.(proc.) = ? g/L	Plasma			Albumin		mass concentration	procedure	g/L	Clinical Biochemistry	Ratio
12	ALAT	NPU19981	Plasma—Alanine transaminase; catalytic concentration(IFCC 2002) = ? µkat/L	P—Alanine transaminase; cat.c.(IFCC 2002) = ? µkat/L	Plasma			Alanine transaminase		catalytic concentration	IFCC 2002	µkat/L	Clinical Biochemistry	Ratio
13	ALP	NPU01144	Plasma—Alkaline phosphatase; catalytic concentration(37 °C; procedure) = ? µkat/L	P—Alkaline phosphatase; cat.c.(37 °C; proc.) = ? µkat/L	Plasma			Alkaline phosphatase		catalytic concentration	37 °C; procedure	µkat/L	Clinical Biochemistry	Ratio
14		NPU01933	Blood—Eosinophilocytes; number concentration = ? × 109/L	B—Eosinophilocytes; num.c. = ? × 10⁹/L	Blood			Eosinophilocytes		number concentration		× 109/L	Clinical Biochemistry	Ratio
15		NPU02636	Blood—Lymphocytes; number concentration = ? × 109/L	B—Lymphocytes; num.c. = ? × 10⁹/L	Blood			Lymphocytes		number concentration		× 109/L	Clinical Biochemistry	Ratio
16		NPU02840	Blood—Monocytes; number concentration = ? × 109/L	B—Monocytes; num.c. = ? × 10⁹/L	Blood			Monocytes		number concentration		× 109/L	Clinical Biochemistry	Ratio
17		NPU01349	Blood—Basophilocytes; number concentration = ? × 109/L	B—Basophilocytes; num.c. = ? × 10⁹/L	Blood			Basophilocytes		number concentration		× 109/L	Clinical Biochemistry	Ratio
18		NPU04998	Plasma—Creatininium; substance concentration(enzymatic) = ? µmol/L	P—Creatininium; subst.c.(enz.) = ? µmol/L	Plasma			Creatininium		substance concentration	enzymatic	µmol/L	Clinical Biochemistry	Ratio

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19	ASAT	NPU22279	Plasma—Aspartate transaminase; catalytic concentration(IFCC 2002) = ? µkat/L	P—Aspartate transaminase; cat.c.(IFCC 2002) = ? µkat/L	Plasma			Aspartate transaminase		catalytic concentration	IFCC 2002	µkat/L	Clinical Biochemistry	Ratio
20		NPU01370	Plasma—Bilirubins; substance concentration = ? µmol/L	P—Bilirubins; subst.c. = ? µmol/L	Plasma			Bilirubins		substance concentration		µmol/L	Clinical Biochemistry	Ratio
21		NPU02902	Blood—Neutrophilocytes; number concentration = ? × 109/L	B—Neutrophilocytes; num.c. = ? × 10⁹/L	Blood			Neutrophilocytes		number concentration		× 109/L	Clinical Biochemistry	Ratio
22	HbA1c (IFCC)	NPU27300	Haemoglobin beta chain(Blood)—N-(1-deoxyfructos-1-yl)haemoglobin beta chain; substance fraction = ? mmol/mol	Haemoglobin beta chain(B)—N-(1-deoxyfructos-1-yl)haemoglobin beta chain; subst.fr. = ? mmol/mol	Haemoglobin beta chain	Blood		N-(1-deoxyfructos-1-yl) haemoglobin beta chain		substance fraction		mmol/mol	Clinical Biochemistry	Ratio
23	eAG (estimated Average Glucose)	NPU27412	Plasma—Glucose; substance concentration(average; Hb A1c; procedure) = ? mmol/L	P—Glucose; subst.c.(average; Hb A1c; proc.) = ? mmol/L	Plasma			Glucose		substance concentration	average; Hb A1c; procedure	mmol/L	Clinical Biochemistry	Ratio
24		NPU01459	Plasma—Carbamide; substance concentration = ? mmol/L	P—Carbamide; subst.c. = ? mmol/L	Plasma			Carbamide		substance concentration		mmol/L	Clinical Biochemistry	Ratio
25	TSH	NPU03577	Plasma—Thyrotropin; arbitrary substance concentration(IRP 80/558; procedure) = ? × 10-3 IU/L	P—Thyrotropin; arb.subst.c.(IRP 80/558; proc.) = ? × 10⁻³ IU/L	Plasma			Thyrotropin		arbitrary substance concentration	IRP 80/558; procedure	× 10-3 IU/L	Clinical Biochemistry	Ratio
26	HbA1c (DCCT)	NPU29296	Haemoglobin(Fe;Blood)—Haemoglobin A1c(Fe); substance fraction(NGSP) = ? %	Hb(Fe; B)—Haemoglobin A1c(Fe); subst.fr.(NGSP) = ? %	Haemoglobin	Fe; Blood		Haemoglobin A1c	Fe	substance fraction	NGSP	%	Clinical Biochemistry	Ratio
27	Total cholesterol	NPU01566	Plasma—Cholesterol+ester; substance concentration = ? mmol/L	P—Cholesterol+ester; subst.c. = ? mmol/L	Plasma			Cholesterol +ester		substance concentration		mmol/L	Clinical Biochemistry	Ratio
28	LDL	NPU01568	Plasma—Cholesterol+ester, in LDL; substance concentration = ? mmol/L	P—Cholesterol+ester, in LDL; subst.c. = ? mmol/L	Plasma			Cholesterol +ester, in LDL		substance concentration		mmol/L	Clinical Biochemistry	Ratio
29	HDL	NPU01567	Plasma—Cholesterol+ester, in HDL; substance concentration = ? mmol/L	P—Cholesterol+ester, in HDL; subst.c. = ? mmol/L	Plasma			Cholesterol +ester, in HDL		substance concentration		mmol/L	Clinical Biochemistry	Ratio
30	GGT	NPU22283	Plasma—gamma-Glutamyltransferase; catalytic concentration(IFCC 2002) = ? µkat/L	P—gamma-Glutamyltransferase; cat.c.(IFCC 2002) = ? µkat/L	Plasma		gamma-	Glutamyl-transferase		catalytic concentration	IFCC 2002	µkat/L	Clinical Biochemistry	Ratio
31		NPU26880	Erythrocytes(Blood)—Haemoglobin; entitic mass = ? pg	Ercs(B)—Haemoglobin; entitic mass = ? pg	Erythrocytes	Blood		Haemoglobin		entitic mass		pg	Clinical Biochemistry	Ratio
32		NPU26631	Blood—Metamyelocytes+Myelocytes +Promyelocytes; number concentration = ? × 109/L	B—Metamyelocytes+Myelocytes+Promyelocytes; num.c. = ? × 10⁹/L	Blood			Metamyelocytes + Myelocytes + Promyelocytes		number concentration		× 109/L	Clinical Biochemistry	Ratio

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33	LDH	NPU19658	Plasma—L-Lactate dehydrogenase; catalytic concentration(IFCC 2002) = ? U/L	P—L-Lactate dehydrogenase; cat.c.(IFCC 2002) = ? U/L	Plasma		L-	Lactate dehydrogenase		catalytic concentration	IFCC 2002	U/L	Clinical Biochemistry	Ratio
34	Triglycerides	NPU04094	Plasma—Triglyceride; substance concentration = ? mmol/L	P—Triglyceride; subst.c. = ? mmol/L	Plasma			Triglyceride		substance concentration		mmol/L	Clinical Biochemistry	Ratio
35	MCV	NPU01944	Blood—Erythrocytes; entitic volume = ? fL	B—Erythrocytes; entitic vol. = ? fL	Blood			Erythrocytes		entitic volume		fL	Clinical Biochemistry	Ratio
36	Haematocrit	NPU01961	Blood—Erythrocytes; volume fraction = ?	B—Erythrocytes; vol.fr. = ?	Blood			Erythrocytes		volume fraction			Clinical Biochemistry	Ratio
37	Calcium	NPU01443	Plasma—Calcium(II); substance concentration = ? mmol/L	P—Calcium(II); subst.c. = ? mmol/L	Plasma			Calcium	II	substance concentration		mmol/L	Clinical Biochemistry	Ratio
38	Vitamin B12	NPU01700	Plasma—Cobalamin; substance concentration = ? pmol/L	P—Cobalamin; subst.c. = ? pmol/L	Plasma			Cobalamin		substance concentration		pmol/L	Clinical Biochemistry	Ratio
39	Calcium ion	NPU04144	Plasma—Calcium ion(free); substance concentration(pH = 7.40;procedure) = ? mmol/L	P—Calcium ion(free); subst.c.(pH = 7.40; proc.) = ? mmol/L	Plasma			Calcium ion	free	substance concentration	pH = 7.40; procedure	mmol/L	Clinical Biochemistry	Ratio
40		NPU02192	Plasma—Glucose; substance concentration = ? mmol/L	P—Glucose; subst.c. = ? mmol/L	Plasma			Glucose		substance concentration		mmol/L	Clinical Biochemistry	Ratio
41	MCHC	NPU02321	Erythrocytes(Blood)—Haemoglobin(Fe); substance concentration = ? mmol/L	Ercs(B)—Haemoglobin(Fe); subst.c. = ? mmol/L	Erythrocytes	Blood		Haemoglobin	Fe	substance concentration		mmol/L	Clinical Biochemistry	Ratio
42	GGT	NPU19657	Plasma—gamma-Glutamyltransferase; catalytic concentration(IFCC 2002) = ? U/L	P—gamma-Glutamyltransferase; cat.c.(IFCC 2002) = ? U/L	Plasma		gamma-	Glutamyltransferase		catalytic concentration	IFCC 2002	U/L	Clinical Biochemistry	Ratio
43	Prothrombine time	NPU18878	Plasma—Coagulation, tissue factor-induced; arbitrary substance concentration(coagulation; procedure) = ? (p.d.u.)	P—Coagulation, tissue factor-induced; arb. subst.c.(coag.; proc.) = ? (p.d.u.)	Plasma			Coagulation, tissue factor-induced		arbitrary substance concentration	coagulation; procedure	(p.d.u.)	Trombosis and Haemostasis	Ratio
44	Vitamin D2+D3	NPU10267	Plasma—Calcifediol+25-Hydroxyergocalciferol; substance concentration = ? nmol/L	P—Calcifediol+25-Hydroxyergocalciferol; subst.c. = ? nmol/L	Plasma			Calcifediol+25-Hydroxyergocalciferol		substance concentration		nmol/L	Clinical Biochemistry	Ratio
45		NPU01960	Blood—Erythrocytes; number concentration = ? × 1012/L	B—Erythrocytes; num.c. = ? × 10¹²/L	Blood			Erythrocytes		number concentration		× 1012/L	Clinical Biochemistry	Ratio
46	25-Hydroxy-Vitamin D2	NPU26810	Plasma—25-Hydroxyergocalciferol; substance concentration = ? nmol/L	P—25-Hydroxyergocalciferol; subst.c. = ? nmol/L	Plasma		25-	Hydroxyergocalciferol		substance concentration		nmol/L	Clinical Biochemistry	Ratio
47		NPU19763	Plasma—Ferritin; mass concentration = ? µg/L	P—Ferritin; mass c. = ? µg/L	Plasma			Ferritin		mass concentration		µg/L	Clinical Biochemistry	Ratio
48		NPU19653	Plasma—Amylase, pancreatic type; catalytic concentration(IFCC 2006) = ? U/L	P—Amylase, pancreatic type; cat.c.(IFCC 2006) = ? U/L	Plasma			Amylase, pancreatic type		catalytic concentration	IFCC 2006	U/L	Clinical Biochemistry	Ratio
49		NPU02508	Plasma—Iron; substance concentration = ? µmol/L	P—Iron; subst.c. = ? µmol/L	Plasma			Iron		substance concentration		µmol/L	Clinical Biochemistry	Ratio

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50		NPU03096	Plasma—Phosphate(P; inorganic); substance concentration = ? mmol/L	P—Phosphate(P; inorganic); subst.c. = ? mmol/L	Plasma			Phosphate (P; inorganic)		substance concentration		mmol/L	Clinical Biochemistry	Ratio
51		NPU03688	Plasma—Urate; substance concentration = ? mmol/L	P—Urate; subst.c. = ? mmol/L	Plasma			Urate		substance concentration		mmol/L	Clinical Biochemistry	Ratio
52		NPU04133	Plasma—Iron binding capacity; substance concentration = ? µmol/L	P—Iron binding capacity; subst.c. = ? µmol/L	Plasma			Iron binding capacity		substance concentration		µmol/L	Clinical Biochemistry	Ratio
53		NPU19652	Plasma—Amylase; catalytic concentration(IFCC 2006) = ? U/L	P—Amylase; cat.c.(IFCC 2006) = ? U/L	Plasma			Amylase		catalytic concentration	IFCC 2006	U/L	Clinical Biochemistry	Ratio
54	Free T4	NPU03579	Plasma—Thyroxine(free); substance concentration = ? pmol/L	P—Thyroxine(free); subst.c. = ? pmol/L	Plasma			Thyroxine	free	substance concentration		pmol/L	Clinical Biochemistry	Ratio
55	LDH	NPU22289	Plasma—L-Lactate dehydrogenase; catalytic concentration(IFCC 2002) = ? µkat/L	P—L-Lactate dehydrogenase; cat.c.(IFCC 2002) = ? µkat/L	Plasma		L-	Lactate dehydrogenase		catalytic concentration	IFCC 2002	µkat/L	Clinical Biochemistry	Ratio
56	Urinary albumin excretion adjusted for creatinine	NPU19661	Urine—Albumin/Creatininium; mass ratio = ? × 10-3 IU/L	U—Albumin/Creatininium; mass ratio = ? × 10⁻³	Urine			Albumin/ Creatininium		mass ratio		× 10-3 IU/L	Clinical Biochemistry	Ratio
57		NPU19986	Plasma—Amylase, pancreatic type; catalytic concentration(IFCC 2006) = ? µkat/L	P—Amylase, pancreatic type; cat.c.(IFCC 2006) = ? µkat/L	Plasma			Amylase, pancreatic type		catalytic concentration	IFCC 2006	µkat/L	Clinical Biochemistry	Ratio
58	MCH	NPU02320	Erythrocytes(Blood)—Haemoglobin(Fe); entitic amount-of-substance = ? fmol	Ercs(B)—Haemoglobin(Fe); entitic am.s. = ? fmol	Erythro-cytes	Blood		Haemoglobin	Fe	entitic amount-of-substance		fmol	Clinical Biochemistry	Ratio
59		NPU08694	Blood—Reticulocytes; number concentration = ? × 109/L	B—Reticulocytes; num.c. = ? × 10⁹/L	Blood			Reticulocytes		number concentration		× 109/L	Clinical Biochemistry	Ratio
60	Adjusted Calcium	NPU04169	Plasma—Calcium(II); substance concentration (adjusted; procedure) = ? mmol/L	P—Calcium(II); subst.c.(adj.; proc.) = ? mmol/L	Plasma			Calcium	II	substance concentration	adjusted; procedure	mmol/L	Clinical Biochemistry	Ratio
61		NPU02070	Plasma—Folate; substance concentration = ? nmol/L	P—Folate; subst.c. = ? nmol/L	Plasma			Folate		substance concentration		nmol/L	Clinical Biochemistry	Ratio
62		NPU04073	Plasma—Homocysteine; substance concentration = ? µmol/L	P—Homocysteine; subst.c. = ? µmol/L	Plasma			Homocysteine		substance concentration		µmol/L	Clinical Biochemistry	Ratio
63		NPU22089	Plasma(cord Blood)—Glucose; substance concentration = ? mmol/L	P(cB)—Glucose; subst.c. = ? mmol/L	Plasma	cord Blood		Glucose		substance concentration		mmol/L	Clinical Biochemistry	Ratio
64		NPU02647	Plasma—Magnesium(II); substance concentration = ? mmol/L	P—Magnesium(II); subst.c. = ? mmol/L	Plasma			Magnesium	II	substance concentration		mmol/L	Clinical Biochemistry	Ratio
65	Pro-BNP	NPU21571	Plasma—Pro-brain natriuretic peptide(1-76); mass concentration = ? ng/L	P—Pro-brain natriuretic peptide(1-76); mass c. = ? ng/L	Plasma			Pro-brain natriuretic peptide(1-76)		mass concentration		ng/L	Clinical Biochemistry	Ratio
66	pCO2	NPU01470	Plasma(Arterial blood)—Carbon dioxide; tension(37 °C) = ? kPa	P(aB)—Carbon dioxide; tension(37 °C) = ? kPa	Plasma	Arterial blood		Carbon dioxide		tension	37 °C	kPa	Clinical Biochemistry	Ratio

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67		NPU09105	Plasma—Calcifediol+ergocalciferol; substance concentration = ? nmol/L	P—Calcifediol+ergocalciferol; subst.c. = ? nmol/L	Plasma			Calcifediol +ergocalciferol		substance concentration		nmol/L	Clinical Biochemistry	Ratio
68	pO2	NPU08977	Plasma(Arterial blood)—Oxygen(O₂); tension (37 °C) = ? kPa	P(aB)—Oxygen(O₂); tension(37 °C) = ? kPa	Plasma	Arterial blood		Oxygen	O₂	tension	37 °C	kPa	Clinical Biochemistry	Ratio
69	CK	NPU19656	Plasma—Creatine kinase; catalytic concentration(IFCC 2002) = ? U/L	P—Creatine kinase; cat.c.(IFCC 2002) = ? U/L	Plasma			Creatine kinase		catalytic concentration	IFCC 2002	U/L	Clinical Biochemistry	Ratio
70		NPU09102	Urine—Creatininium; substance concentration = ? mmol/L	U—Creatininium; subst.c. = ? mmol/L	Urine			Creatininium		substance concentration		mmol/L	Clinical Biochemistry	Ratio
71		NPU28172	Blood—Neutrophilocytes(segmented+band); number concentration = ? × 109/L	B—Neutrophilocytes(segmented+band); num.c. = ? × 10⁹/L	Blood			Neutrophilocytes	seg-mented + band	number concentration		× 109/L	Clinical Biochemistry	Ratio
72		NPU03943	Plasma(Arterial blood)—Lactate; substance concentration = ? mmol/L	P(aB)—Lactate; subst.c. = ? mmol/L	Plasma	Arterial blood		Lactate		substance concentration		mmol/L	Clinical Biochemistry	Ratio
73		NPU19677	Urine—Albumin; mass concentration(procedure) = ? mg/L	U—Albumin; mass c.(proc.) = ? mg/L	Urine			Albumin		mass concentration	procedure	mg/L	Clinical Biochemistry	Ratio
74		NPU28842	Urine—Albumin/Creatininium; mass coefficient(mass/amount-of-substance;procedure) = ? g/mol	U—Albumin/Creatininium; mass coefficient(mass/am.s.; proc.) = ? g/mol	Urine			Albumin/ Creatininium		mass coefficient	mass/amount-of-substance; procedure sprocedure-substance; procedure substance; esubstance; procedure	g/mol	Clinical Biochemistry	Ratio
75	VLDL	NPU01569	Plasma—Cholesterol+ester, in VLDL; substance concentration = ? mmol/L	P—Cholesterol+ester, in VLDL; subst.c. = ? mmol/L	Plasma			Cholesterol +ester, in VLDL		substance concentration		mmol/L	Clinical Biochemistry	Ratio
76		NPU04191	Transferrin(Fe-binding sites;Plasma)—Iron; substance fraction = ?	Transferrin(Fe-binding sites; P)—Iron; subst.fr. = ?	Transfer-rin	Fe-binding sites; Plasma		Iron		substance fraction			Clinical Biochemistry	Ratio
77	CO2	NPU01472	Plasma(Venous blood)—Carbon dioxide; substance concentration = ? mmol/L	P(vB)—Carbon dioxide; subst.c. = ? mmol/L	Plasma	Venous blood		Carbon dioxide		substance concentration		mmol/L	Clinical Biochemistry	Ratio
78	Urine pH	NPU02415	Urine—Hydrogen ion; pH(procedure) = ?	U—Hydrogen ion; pH(proc.) = ?	Urine			Hydrogen ion		pH	procedure		Clinical Biochemistry	Loga-rith-mic
79	Fasting triglycerides	NPU03620	Plasma(fasting Patient)—Triglyceride; substance concentration = ? mmol/L	P(fPt)—Triglyceride; subst.c. = ? mmol/L	Plasma	fasting Patient		Triglyceride		substance concentration		mmol/L	Clinical Biochemistry	Ratio
80	Base excess	NPU03815	Extracellular fluid—Base excess; substance concentration(actual-norm) = ? mmol/L	Ecf—Base excess; subst.c.(actual-norm) = ? mmol/L	Extracel-lular fluid			Base excess		substance concentration	actual-norm	mmol/L	Clinical Biochemistry	Dif-feren-tial
81	HbA1c	NPU03835	Haemoglobin(Fe;Blood)—Haemoglo-bin A1c(Fe); substance fraction = ?	Hb(Fe; B)—Haemoglobin A1c(Fe); subst.fr. = ?	Haemo-globin	Fe; Blood		Haemoglobin A1c	Fe	substance fraction			Clinical Biochemistry	Ratio

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82	Free T3	NPU03625	Plasma—Triiodothyronine(free); substance concentration = ? pmol/L	P—Triiodothyronine(free); subst.c. = ? pmol/L	Plasma			Triiodothyronine	free	substance concentration		pmol/L	Clinical Biochemistry	Ratio
83	T3	NPU03624	Plasma—Triiodothyronine; substance concentration = ? nmol/L	P—Triiodothyronine; subst.c. = ? nmol/L	Plasma			Triiodothyronine		substance concentration		nmol/L	Clinical Biochemistry	Ratio
84	T4	NPU03578	Plasma—Thyroxine; substance concentration = ? nmol/L	P—Thyroxine; subst.c. = ? nmol/L	Plasma			Thyroxine		substance concentration		nmol/L	Clinical Biochemistry	Ratio
85	TPO antibodies	NPU20041	Plasma—Thyroid peroxidase antibody; arbitrary substance concentration(IRP 66/387; procedure) = ? × 10^3 IU/L	P—Thyroid peroxidase antibody; arb.subst.c.(IRP 66/387; proc.) = ? × 10^3 IU/L	Plasma			Thyroid peroxidase antibody		arbitrary substance concentration	IRP 66/387; procedure	× 10^3 IU/L	Clinical Biochemistry	Ratio
86	Hb in Faeces	NPU29057	Faeces—Haemoglobin; arbitrary substance concentration (procedure) = ? (p.d.u.)	F—Haemoglobin; arb.subst.c.(proc.) = ? (p.d.u.)	Faeces			Haemoglobin		arbitrary substance concentration	procedure	(p.d.u.)	Clinical Biochemistry	Ratio
87	PSA	NPU08669	Plasma—Prostata specific antigen; mass concentration = ? µg/L	P—Prostata specific antigen; mass c. = ? µg/L	Plasma			Prostata specific antigen		mass concentration		µg/L	Clinical Biochemistry	Ratio
88	activated partial thromboplastin time (APTT)	NPU01682	Plasma—Coagulation, surface-induced; time(procedure) = ? s	P—Coagulation, surface-induced; time(proc.) = ? s	Plasma			Coagulation, surface-induced		time	procedure	s	Trombosis and Haemostasis	Ratio
89	RDW-CV	NPU18162	Erythrocytes(Blood)—Erythrocyte volumes; relative distribution width(procedure) = ?	Ercs(B)—Erythrocyte volumes; relative distribution width(proc.) = ?	Erythrocytes	Blood		Erythrocyte volumes		relative distribution width	procedure		Clinical Biochemistry	Ratio
90		NPU14267	Blood—Large unstained cells; number concentration = ? × 109/L	B—Large unstained cells; num.c. = ? × 10⁹/L	Blood			Large unstained cells		number concentration		× 109/L	Clinical Biochemistry	Ratio
91	PTH	NPU03028	Plasma—Parathyrin; substance concentration = ? pmol/L	P—Parathyrin; subst.c. = ? pmol/L	Plasma			Parathyrin		substance concentration		pmol/L	Clinical Biochemistry	Ratio
92	ASAT	NPU19654	Plasma—Aspartate transaminase; catalytic concentration(IFCC 2002) = ? U/L	P—Aspartate transaminase; cat.c.(IFCC 2002) = ? U/L	Plasma			Aspartate transaminase		catalytic concentration	IFCC 2002	U/L	Clinical Biochemistry	Ratio
93	IgE	NPU56406	Plasma—Immunoglobulin E; arbitrary substance concentration(IS 11/234 ;procedure) = ? × 10^3 IU/L	P—Immunoglobulin E; arb.subst.c.(IS 11/234; proc.) = ? × 10^3 IU/L	Plasma			Immunoglobulin E		arbitrary substance concentration	IS 11/234; procedure	× 10^3 IU/L	Clinical Allergology	Ratio
94		NPU26470	Plasma—Transferrin; mass concentration = ? g/L	P—Transferrin; mass c. = ? g/L	Plasma			Transferrin		mass concentration		g/L	Clinical Biochemistry	Ratio
95		NPU21533	Plasma(Arterial blood)—Glucose; substance concentration = ? mmol/L	P(aB)—Glucose; subst.c. = ? mmol/L	Plasma	Arterial blood		Glucose		substance concentration		mmol/L	Clinical Biochemistry	Ratio
96		NPU18410	Plasma—Cholesterol+ester/ Cholesterol+ester, in HDL; substance ratio = ?	P—Cholesterol+ester/ Cholesterol+ester, in HDL; subst.ratio = ?	Plasma			Cholesterol + ester / Cholesterol + ester, in HDL		substance ratio			Clinical Biochemistry	Ratio

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97	IgG	NPU19814	Plasma—Immunoglobulin G; mass concentration = ? g/L	P—Immunoglobulin G; mass c. = ? g/L	Plasma			Immunoglobulin G		mass concentration		g/L	Clinical Biochemistry	Ratio
98		NPU10762	Blood—Atypical cells; number concentration = ? × 109/L	B—Atypical cells; num.c. = ? × 10⁹/L	Blood			Atypical cells		number concentration		× 109/L	Clinical Biochemistry	Ratio
99	IgA	NPU19795	Plasma—Immunoglobulin A; mass concentration = ? g/L	P—Immunoglobulin A; mass c. = ? g/L	Plasma			Immunoglobulin A		mass concentration		g/L	Clinical Biochemistry	Ratio
100		NPU03607	Plasma—Transferrin; substance concentration = ? µmol/L	P—Transferrin; subst.c. = ? µmol/L	Plasma			Transferrin		substance concentration		µmol/L	Clinical Biochemistry	Ratio
101	TSH	NPU27547	Plasma—Thyrotropin; arbitrary substance concentration(IRP 81/565;procedure) = ? × 10-3 IU/L	P—Thyrotropin; arb.subst.c.(IRP 81/565; proc.) = ? × 10⁻³ IU/L	Plasma			Thyrotropin		arbitrary substance concentration	IRP 81/565; procedure	× 10-3 IU/L	Clinical Biochemistry	Ratio
102	IgM	NPU19825	Plasma—Immunoglobulin M; mass concentration = ? g/L	P—Immunoglobulin M; mass c. = ? g/L	Plasma			Immunoglobulin M		mass concentration		g/L	Clinical Biochemistry	Ratio
103	HCO3	NPU02410	Plasma—Hydrogen carbonate; substance concentration (pCO₂ = 5.3 kPa; 37 °C) = ? mmol/L	P—Hydrogen carbonate; subst.c.(pCO₂ = 5.3 kPa; 37 °C) = ? mmol/L	Plasma			Hydrogen carbonate		substance concentration	pCO₂ = 5.3 kPa; 37 °C	mmol/L	Clinical Biochemistry	Ratio
104		NPU01368	Plasma—Bilirubin glucuronide; substance concentration = ? µmol/L	P—Bilirubin glucuronide; subst.c. = ? µmol/L	Plasma			Bilirubin glucuronide		substance concentration		µmol/L	Clinical Biochemistry	Ratio
105		NPU09356	Plasma—Urate; substance concentration = ? µmol/L	P—Urate; subst.c. = ? µmol/L	Plasma			Urate		substance concentration		µmol/L	Clinical Biochemistry	Ratio
106	25-Hydroxy-Vitamin D3	NPU01435	Plasma—Calcifediol; substance concentration = ? nmol/L	P—Calcifediol; subst.c. = ? nmol/L	Plasma			Calcifediol		substance concentration		nmol/L	Clinical Biochemistry	Ratio
107	O2	NPU10167	Patient—Oxygen(administered); volume rate = ? L/min	Pt—Oxygen(administered); vol.rate = ? L/min	Patient			Oxygen	administered	volume rate		L/min	Clinical Biochemistry	Ratio
108	Base excess	NPU12518	Plasma(Arterial blood)—Base excess; substance concentration(actual-norm) = ? mmol/L	P(aB)—Base excess; subst.c.(actual-norm) = ? mmol/L	Plasma	Arterial blood		Base excess		substance concentration	actual-norm	mmol/L	Clinical Biochemistry	Differential
109	A1AT	NPU19692	Plasma—alpha 1-Antitrypsin; mass concentration = ? g/L	P—alpha 1-Antitrypsin; mass c. = ? g/L	Plasma		alpha 1-	Antitrypsin		mass concentration		g/L	Clinical Biochemistry	Ratio
110	D-Dimer	NPU28289	Plasma—Fibrin D-dimer; arbitrary substance concentration(procedure) = ? (p.d.u.)	P—Fibrin D-dimer; arb.subst.c.(proc.) = ? (p.d.u.)	Plasma			Fibrin D-dimer		arbitrary substance concentration	procedure	(p.d.u.)	Trombosis and Haemostasis	Ratio
111		NPU01536	Plasma—Chloride; substance concentration = ? mmol/L	P—Chloride; subst.c. = ? mmol/L	Plasma			Chloride		substance concentration		mmol/L	Clinical Biochemistry	Ratio
112	TfR	NPU28336	Plasma—Transferrinreceptor fragment; mass concentration = ? mg/L	P—Transferrinreceptor fragment; mass c. = ? mg/L	Plasma			Transferrinreceptor fragment		mass concentration		mg/L	Clinical Biochemistry	Ratio
113	ESR	NPU03404	Blood—Sedimentation reaction; length(procedure) = ? mm	B—Sedimentation reaction; length(proc.) = ? mm	Blood			Sedimentation reaction		length	procedure	mm	Clinical Biochemistry	Ratio
114		NPU01943	Blood—Erythroblasts; number concentration = ? × 109/L	B—Erythroblasts; num.c. = ? × 10⁹/L	Blood			Erythroblasts		number concentration		× 109/L	Clinical Biochemistry	Ratio

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115		NPU23296	Urine—Buprenorphine; mass concentration = ? µg/L	U—Buprenorphine; mass c. = ? µg/L	Urine			Buprenorphine		mass concentration		µg/L	Clinical Pharmacology	Ratio
116	TNI	NPU27591	Plasma—Troponin I, cardiac muscle; mass concentration = ? ng/L	P—Troponin I, cardiac muscle; mass c. = ? ng/L	Plasma			Troponin I, cardiac muscle		mass concentration		ng/L	Clinical Biochemistry	Ratio
117		NPU01808	Urine—Creatininium; substance concentration = ? µmol/L	U—Creatininium; subst.c. = ? µmol/L	Urine			Creatininium		substance concentration		µmol/L	Clinical Biochemistry	Ratio
118	Anion gap	NPU20189	Plasma—Anion gap(excl. K+); substance concentration = ? mmol/L	P—Anion gap(excl. K+); subst.c. = ? mmol/L	Plasma			Anion gap(excl. K+)		substance concentration		mmol/L	Clinical Biochemistry	Differential
119	6-MAM	NPU24861	Urine—6-O-Monoacetylmorphine; mass concentration = ? µg/L	U—6-O-Monoacetylmorphine; mass c. = ? µg/L	Urine		6-O-	Monoacetylmorphine		mass concentration		µg/L	Clinical Pharmacology	Ratio
120		NPU03976	Blood—Myelocytes; number concentration = ? × 109/L	B—Myelocytes; num.c. = ? × 10⁹/L	Blood			Myelocytes		number concentration		× 109/L	Clinical Biochemistry	Ratio
121	CK-MB	NPU19750	Plasma—Creatine kinase MB; mass concentration = ? µg/L	P—Creatine kinase MB; mass c. = ? µg/L	Plasma			Creatine kinase MB		mass concentration		µg/L	Clinical Biochemistry	Ratio
122		NPU57688	Plasma—Food allergen antibody(IgE); arbitrary substance concentration((f1; f2; f3; f4; f13; f14);procedure) = ? (p.d.u.)	P—Food allergen antibody(IgE); arb. subst.c.((f1; f2; f3; f4; f13; f14); proc.) = ? (p.d.u.)	Plasma			Food allergen antibody	IgE	arbitrary substance concentration	(f1; f2; f3; f4; f13; f14); procedure	(p.d.u.)	Clinical Allergology	Ratio
123	THC-COOH	NPU28551	Urine—11-Nor-delta(9)-tetrahydrocannabinol-9-carboxylic acid; mass concentration = ? µg/L	U—11-Nor-delta(9)-tetrahydrocannabinol-9-carboxylic acid; mass c. = ? µg/L	Urine		11-	Nor-delta(9)-tetrahydrocannabinol-9-carboxylic acid		mass concentration		µg/L	Clinical Pharmacology	Ratio
124		NPU03978	Blood—Metamyelocytes; number concentration = ? × 109/L	B—Metamyelocytes; num.c. = ? × 10⁹/L	Blood			Metamyelocytes		number concentration		× 109/L	Clinical Biochemistry	Ratio
125		NPU19788	Plasma—Haptoglobin; mass concentration = ? g/L	P—Haptoglobin; mass c. = ? g/L	Plasma			Haptoglobin		mass concentration		g/L	Clinical Biochemistry	Ratio
126		NPU23111	Urine—Amfetamine; mass concentration = ? µg/L	U—Amfetamine; mass c. = ? µg/L	Urine			Amfetamine		mass concentration		µg/L	Clinical Pharmacology	Ratio
127	TNT	NPU27501	Plasma—Troponin T, cardiac muscle; mass concentration = ? ng/L	P—Troponin T, cardiac muscle; mass c. = ? ng/L	Plasma			Troponin T, cardiac muscle		mass concentration		ng/L	Clinical Biochemistry	Ratio
128		NPU28062	Urine—Oxazepam; mass concentration = ? µg/L	U—Oxazepam; mass c. = ? µg/L	Urine			Oxazepam		mass concentration		µg/L	Clinical Pharmacology	Ratio
129	Free PSA	NPU12534	Plasma—Prostata specific antigen(free); mass concentration = ? µg/L	P—Prostata specific antigen(free); mass c. = ? µg/L	Plasma			Prostata specific antigen	free	mass concentration		µg/L	Clinical Biochemistry	Ratio
130		NPU28061	Urine—Nordazepam; mass concentration = ? µg/L	U—Nordazepam; mass c. = ? µg/L	Urine			Nordazepam		mass concentration		µg/L	Clinical Pharmacology	Ratio

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131		NPU03972	Blood—Blast cells(unspecified); number concentration(procedure) = ? × 109/L	B—Blast cells(unspecified); num.c.(proc.) = ? × 10⁹/L	Blood			Blast cells	unspecified	number concentration	procedure	× 109/L	Clinical Biochemistry	Ratio
132		NPU28056	Urine—7-Aminoclonazepam; mass concentration = ? µg/L	U—7-Aminoclonazepam; mass c. = ? µg/L	Urine		7-	Aminoclonazepam		mass concentration		µg/L	Clinical Pharmacology	Ratio
133		NPU03974	Blood—Promyelocytes; number concentration = ? × 109/L	B—Promyelocytes; num.c. = ? × 10⁹/L	Blood			Promyelocytes		number concentration		× 109/L	Clinical Biochemistry	Ratio
134		NPU03768	Plasma—Zinc; substance concentration = ? µmol/L	P—Zinc; subst.c. = ? µmol/L	Plasma			Zinc		substance concentration		µmol/L	Clinical Biochemistry	Ratio
135		NPU28054	Urine—alpha-Hydroxyalprazolam; mass concentration = ? µg/L	U—alpha-Hydroxyalprazolam; mass c. = ? µg/L	Urine		alpha-	Hydroxyalprazolam		mass concentration		µg/L	Clinical Pharmacology	Ratio
136	hCG+beta chain	NPU19579	Plasma—Choriogonadotropin+beta-chain; arbitrary substance concentration(IS 75/589;procedure) = ? IU/L	P—Choriogonadotropin+beta-chain; arb.subst.c.(IS 75/589; proc.) = ? IU/L	Plasma			Choriogonadotropin +beta-chain		arbitrary substance concentration	IS 75/589; procedure	IU/L	Clinical Biochemistry	Ratio
137		NPU28057	Urine—7-Aminonitrazepam; mass concentration = ? µg/L	U—7-Aminonitrazepam; mass c. = ? µg/L	Urine		7-	Aminonitrazepam		mass concentration		µg/L	Clinical Pharmacology	Ratio
138		NPU19676	Urine—Albumin; mass concentration(procedure) = ? g/L	U—Albumin; mass c.(proc.) = ? g/L	Urine			Albumin		mass concentration	procedure	g/L	Clinical Biochemistry	Ratio
139		NPU24776	Urine—Metamfetamine; mass concentration = ? µg/L	U—Metamfetamine; mass c. = ? µg/L	Urine			Metamfetamine		mass concentration		µg/L	Clinical Pharmacology	Ratio
140		NPU03278	Plasma—Protein; mass concentration = ? g/L	P—Protein; mass c. = ? g/L	Plasma			Protein		mass concentration		g/L	Clinical Biochemistry	Ratio
141		NPU28055	Urine—7-Aminoflunitrazepam; mass concentration = ? µg/L	U—7-Aminoflunitrazepam; mass c. = ? µg/L	Urine		7-	Aminoflunitrazepam		mass concentration		µg/L	Clinical Pharmacology	Ratio
142	Anion gap	NPU18415	Plasma—Anion gap(incl. K+); substance concentration = ? mmol/L	P—Anion gap(incl. K+); subst.c. = ? mmol/L	Plasma			Anion gap(incl. K+)		substance concentration		mmol/L	Clinical Biochemistry	Differential
143		NPU54550	Urine—Ephedrine; mass concentration = ? µg/L	U—Ephedrine; mass c. = ? µg/L	Urine			Ephedrine		mass concentration		µg/L	Clinical Pharmacology	Ratio
144		NPU03356	Erythrocytes(Blood)—Reticulocytes; number fraction = ? × 10-3 IU/L	Ercs(B)—Reticulocytes; num.fr. = ? × 10⁻³	Erythrocytes	Blood		Reticulocytes		number fraction		× 10-3 IU/L	Clinical Biochemistry	Ratio
145		NPU54587	Urine—4-Methoxyamphetamine; mass concentration = ? µg/L	U—4-Methoxyamphetamine; mass c. = ? µg/L	Urine		4-	Methoxyamphetamine		mass concentration		µg/L	Clinical Pharmacology	Ratio
146	FSH	NPU04014	Plasma—Follitropin; arbitrary substance concentration(IRP 78/549; procedure) = ? IU/L	P—Follitropin; arb.subst.c.(IRP 78/549; proc.) = ? IU/L	Plasma			Follitropin		arbitrary substance concentration	IRP 78/549; procedure	IU/L	Clinical Biochemistry	Ratio
147		NPU54749	Urine—4-Methoxymethamphetamine; mass concentration = ? µg/L	U—4-Methoxymethamphetamine; mass c. = ? µg/L	Urine		4-	Methoxymethamphetamine		mass concentration		µg/L	Clinical Pharmacology	Ratio

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148	HCO3	NPU14266	Plasma(Venous blood)—Hydrogen carbonate; substance concentration(actual;37 °C) = ? mmol/L	P(vB)—Hydrogen carbonate; subst.c.(actual; 37 °C) = ? mmol/L	Plasma	Venous blood		Hydrogen carbonate		substance concentration	actual; 37 °C	mmol/L	Clinical Biochemistry	Ratio
149		NPU28311	Urine—Benzoylecgonine; mass concentration = ? µg/L	U—Benzoylecgonine; mass c. = ? µg/L	Urine			Benzoylecgonine		mass concentration		µg/L	Clinical Pharmacology	Ratio
150		NPU28315	Erythrocytes(Blood)—Haemoglobin; mass concentration = ? g/L	Ercs(B)—Haemoglobin; mass c. = ? g/L	Erythrocytes	Blood		Haemoglobin		mass concentration		g/L	Clinical Biochemistry	Ratio
151	CCP	NPU19947	Plasma—Cyclic citrullinated peptide antibody(IgG); arbitrary substance concentration(procedure) = ? (p.d.u.)	P—Cyclic citrullinated peptide antibody(IgG); arb. subst.c.(proc.) = ? (p.d.u.)	Plasma			Cyclic citrullinated peptide antibody	IgG	arbitrary substance concentration	procedure	(p.d.u.)	Clinical Biochemistry	Ratio
152		NPU24819	Urine—3,4-Methylenedioxyamfetamine; mass concentration = ? µg/L	U—3,4-Methylenedioxyamfetamine; mass c. = ? µg/L	Urine		3,4-	Methylenedioxyamfetamine		mass concentration		µg/L	Clinical Pharmacology	Ratio
153		NPU04708	Blood—Plasmocytes; number concentration = ? × 109/L	B—Plasmocytes; num.c. = ? × 10⁹/L	Blood			Plasmocytes		number concentration		× 109/L	Clinical Biochemistry	Ratio
154		NPU24821	Urine—3,4-Methylenedioxymetamfetamine; mass concentration = ? µg/L	U—3,4-Methylenedioxymetamfetamine; mass c. = ? µg/L	Urine		3,4-	Methylenedioxymetamfetamine		mass concentration		µg/L	Clinical Pharmacology	Ratio
155	LH	NPU02618	Plasma—Lutropin; arbitrary substance concentration(IS 80/552; procedure) = ? IU/L	P—Lutropin; arb.subst.c.(IS 80/552; proc.) = ? IU/L	Plasma			Lutropin		arbitrary substance concentration	IS 80/552; procedure	IU/L	Clinical Biochemistry	Ratio
156		NPU19768	Plasma—Fibrinogen; mass concentration(coagulation;procedure) = ? g/L	P—Fibrinogen; mass c.(coag.; proc.) = ? g/L	Plasma			Fibrinogen		mass concentration	coagulation; procedure	g/L	Trombosis and Haemostasis	Ratio
157		NPU54291	Urine—Ritalinic acid; mass concentration = ? µg/L	U—Ritalinic acid; mass c. = ? µg/L	Urine			Ritalinic acid		mass concentration		µg/L	Clinical Pharmacology	Ratio
158	C-peptide	NPU04149	Plasma(fasting Patient)—Proinsulin C-peptide; substance concentration = ? nmol/L	P(fPt)—Proinsulin C-peptide; subst.c. = ? nmol/L	Plasma	fasting Patient		Proinsulin C-peptide		substance concentration		nmol/L	Clinical Biochemistry	Ratio
159	Anti-Tgase	NPU14566	Plasma—Transglutaminase antibody(IgA); arbitrary substance concentration(procedure) = ? (p.d.u.)	P—Transglutaminase antibody(IgA); arb. subst.c.(proc.) = ? (p.d.u.)	Plasma			Transglutaminase antibody	IgA	arbitrary substance concentration	procedure	(p.d.u.)	Clinical Biochemistry	Ratio
160		NPU24781	Urine—Methadone; mass concentration = ? µg/L	U—Methadone; mass c. = ? µg/L	Urine			Methadone		mass concentration		µg/L	Clinical Pharmacology	Ratio
161	Calcium ion	NPU01446	Plasma—Calcium ion(free); substance concentration = ? mmol/L	P—Calcium ion(free); subst.c. = ? mmol/L	Plasma			Calcium ion	free	substance concentration		mmol/L	Clinical Biochemistry	Ratio
162		NPU23591	Urine—Codeine; mass concentration = ? µg/L	U—Codeine; mass c. = ? µg/L	Urine			Codeine		mass concentration		µg/L	Clinical Pharmacology	Ratio
163		NPU03958	Urine—Protein; mass concentration = ? g/L	U—Protein; mass c. = ? g/L	Urine			Protein		mass concentration		g/L	Clinical Biochemistry	Ratio
164		NPU23881	Urine—Ethylmorphine; mass concentration = ? µg/L	U—Ethylmorphine; mass c. = ? µg/L	Urine			Ethylmorphine		mass concentration		µg/L	Clinical Pharmacology	Ratio

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165		NPU03695	Patient—Urine; volume(procedure) = ? mL	Pt—Urine; vol.(proc.) = ? mL	Patient			Urine		volume	procedure	mL	Clinical Biochemistry	Ratio
166		NPU28000	Urine—Oxycodone; mass concentration = ? µg/L	U—Oxycodone; mass c. = ? µg/L	Urine			Oxycodone		mass concentration		µg/L	Clinical Pharmacology	Ratio
167	Ret-Hb	NPU17007	Reticulocytes(Blood)—Haemoglobin(Fe); entitic amount-of-substance = ? fmol	Rtcs(B)—Haemoglobin(Fe); entitic am.s. = ? fmol	Reticulocytes	Blood		Haemoglobin	Fe	entitic amount-of-substance		fmol	Clinical Biochemistry	Ratio
168		NPU27388	Urine—Tramadol; mass concentration = ? µg/L	U—Tramadol; mass c. = ? µg/L	Urine			Tramadol		mass concentration		µg/L	Clinical Pharmacology	Ratio
169	HCO3	NPU02409	Plasma(Arterial blood)—Hydrogen carbonate; substance concentration(actual; 37 °C) = ? mmol/L	P(aB)—Hydrogen carbonate; subst.c.(actual; 37 °C) = ? mmol/L	Plasma	Arterial blood		Hydrogen carbonate		substance concentration	actual; 37 °C	mmol/L	Clinical Biochemistry	Ratio
170		NPU53120	Urine—Fentanyl; mass concentration = ? µg/L	U—Fentanyl; mass c. = ? µg/L	Urine			Fentanyl		mass concentration		µg/L	Clinical Pharmacology	Ratio
171	Ca125	NPU01448	Plasma—Cancer antigen 125; arbitrary substance concentration(procedure) = ? (p.d.u.)	P—Cancer antigen 125; arb.subst.c.(proc.) = ? (p.d.u.)	Plasma			Cancer antigen 125		arbitrary substance concentration	procedure	(p.d.u.)	Clinical Biochemistry	Ratio
172	CK	NPU22281	Plasma—Creatine kinase; catalytic concentration(IFCC 2002) = ? µkat/L	P—Creatine kinase; cat.c.(IFCC 2002) = ? µkat/L	Plasma			Creatine kinase		catalytic concentration	IFCC 2002	µkat/L	Clinical Biochemistry	Ratio
173	ESR	NPU17589	Blood—Sedimentation reaction; arbitrary length(procedure) = ? (p.d.u.)	B—Sedimentation reaction; arbitrary length(proc.) = ? (p.d.u.)	Blood			Sedimentation reaction		arbitrary length	procedure	(p.d.u.)	Clinical Biochemistry	Ratio
174		NPU28402	Plasma—Connective tissue disease related antibody; arbitrary substance concentration(procedure) = ? (p.d.u.)	P—Connective tissue disease related antibody; arb.subst.c.(proc.) = ? (p.d.u.)	Plasma			Connective tissue disease related antibody		arbitrary substance concentration	procedure	(p.d.u.)	Clinical Immunology	Ratio
175		NPU53097	Urine—Zopiclone; mass concentration = ? µg/L	U—Zopiclone; mass c. = ? µg/L	Urine			Zopiclone		mass concentration		µg/L	Clinical Pharmacology	Ratio
176		NPU18247	Plasma—Prolactin; arbitrary substance concentration(IS 84/500; procedure) = ? × 10-3 IU/L	P—Prolactin; arb. subst.c.(IS 84/500; proc.) = ? × 10⁻³ IU/L	Plasma			Prolactin		arbitrary substance concentration	IS 84/500; procedure	× 10-3 IU/L	Clinical Biochemistry	Ratio
177		NPU22299	Plasma—Apolipoprotein B; mass concentration = ? g/L	P—Apolipoprotein B; mass c. = ? g/L	Plasma			Apolipoprotein B		mass concentration		g/L	Clinical Biochemistry	Ratio
178		NPU53093	Urine—Zolpidem; mass concentration = ? µg/L	U—Zolpidem; mass c. = ? µg/L	Urine			Zolpidem		mass concentration		µg/L	Clinical Pharmacology	Ratio
179	INR	NPU01685	Plasma—Coagulation, tissue factor-induced; relative time(actual/norm; INR; IRP 67/40;procedure) = ?	P—Coagulation, tissue factor-induced; rel.time(actual/norm; INR; IRP 67/40; proc.) = ?	Plasma			Coagulation, tissue factor-induced		relative time	actual/norm; INR;IRP 67/40; procedure		Trombosis and Haemostasis	Ratio
180		NPU01972	Plasma—Estradiol; substance concentration = ? nmol/L	P—Estradiol; subst.c. = ? nmol/L	Plasma			Estradiol		substance concentration		nmol/L	Clinical Biochemistry	Ratio

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181		NPU03543	Plasma—Testosterone; substance concentration = ? nmol/L	P—Testosterone; subst.c. = ? nmol/L	Plasma			Testosterone		substance concentration		nmol/L	Clinical Biochemistry	Ratio
182		NPU19695	Plasma—Apolipoprotein A1; mass concentration = ? g/L	P—Apolipoprotein A1; mass c. = ? g/L	Plasma			Apolipoprotein A1		mass concentration		g/L	Clinical Biochemistry	Ratio
183		NPU04166	Urine—Acetoacetate; substance concentration = ? mmol/L	U—Acetoacetate; subst.c. = ? mmol/L	Urine			Acetoacetate		substance concentration		mmol/L	Clinical Biochemistry	Ratio
184	pCO2	NPU12481	Plasma(cord Blood)—Carbon dioxide; tension(37 °C) = ? kPa	P(cB)—Carbon dioxide; tension(37 °C) = ? kPa	Plasma	cord Blood		Carbon dioxide		tension	37 °C	kPa	Clinical Biochemistry	Ratio
185		NPU09226	Prostata specific antigen(Plasma)—Prostata specific antigen(free); mass fraction = ?	Prostata specific antigen(P)—Prostata specific antigen(free); mass fr. = ?	Prostata specific antigen	Plasma		Prostata specific antigen	free	mass fraction			Clinical Biochemistry	Ratio
186		NPU13041	Plasma—Birch antibody(IgE); arbitrary substance concentration(t3;procedure) = ? (p.d.u.)	P—Birch antibody(IgE); arb.subst.c.(t3; proc.) = ? (p.d.u.)	Plasma			Birch antibody	IgE	arbitrary substance concentration	t3; procedure	(p.d.u.)	Clinical Allergology	Ratio
187		NPU27315	Plasma—Inhalation antigen antibody(IgE); arbitrary substance concentration(IRP 75/502;(t3; g6; w6; e1; e5; d1; e3; m2; d2; t9; w19); procedure) = ? × 10^3 IU/L	P—Inhalation antigen antibody(IgE); arb.subst.c.(IRP 75/502; (t3; g6; w6; e1; e5; d1; e3; m2; d2; t9; w19); proc.) = ? × 10^3 IU/L	Plasma			Inhalation antigen antibody	IgE	arbitrary substance concentration	IRP 75/502; (t3; g6; w6; e1; e5; d1; e3; m2; d2; t9; w19); procedure	× 10^3 IU/L	Clinical Allergology	Ratio
188		NPU02195	Plasma(venous Blood;fasting Patient)—Glucose; substance concentration = ? mmol/L	P(vB; fPt)—Glucose; subst.c. = ? mmol/L	Plasma	venous Blood; fasting Patient		Glucose		substance concentration		mmol/L	Clinical Biochemistry	Ratio
189		NPU13098	Plasma—Timothy grass antibody(IgE); arbitrary substance concentration(g6;procedure) = ? (p.d.u.)	P—Timothy grass antibody(IgE); arb.subst.c.(g6; proc.) = ? (p.d.u.)	Plasma			Timothy grass antibody	IgE	arbitrary substance concentration	g6; procedure	(p.d.u.)	Clinical Allergology	Ratio
190		NPU18631	Urine—Bacterium; arbitrary number(procedure) = ? (p.d.u.)	U—Bacterium; arb.num.(proc.) = ? (p.d.u.)	Urine			Bacterium		arbitrary number	procedure	(p.d.u.)	Clinical Microbiology	Ratio
191		NPU21531	Plasma(Venous blood)—Glucose; substance concentration = ? mmol/L	P(vB)—Glucose; subst.c. = ? mmol/L	Plasma	Venous blood		Glucose		substance concentration		mmol/L	Clinical Biochemistry	Ratio
192		NPU13135	Plasma—Mugwort antibody(IgE); arbitrary substance concentration(w6;procedure) = ? (p.d.u.)	P—Mugwort antibody(IgE); arb.subst.c.(w6; proc.) = ? (p.d.u.)	Plasma			Mugwort antibody	IgE	arbitrary substance concentration	w6; procedure	(p.d.u.)	Clinical Allergology	Ratio
193		NPU53974	Plasma—Amylase; catalytic concentration(37 °C; procedure) = ? U/L	P—Amylase; cat.c.(37 °C; proc.) = ? U/L	Plasma			Amylase		catalytic concentration	37 °C; procedure	U/L	Clinical Biochemistry	Ratio
194		NPU04146	Plasma—Cholesterol+ester, in LDL/Cholesterol+ester, in HDL; substance ratio = ?	P—Cholesterol+ester, in LDL/Cholesterol+ester, in HDL; subst.ratio = ?	Plasma			Cholesterol +ester, in LDL/ Cholesterol +ester, in HDL		substance ratio			Clinical Biochemistry	Ratio

Rank (see commentary)	*Non-authorized indications (trivial terms and abbreviations)	**NPU identifier	Comprehensive, systematic NPU term of laboratory examinations	Abbreviated NPU term of laboratory examinations	System	Sys-spec.	Prefix	Component	Comp-spec.	Kind-of-property"	Procedure	Unit	Speciality	Scale type
195	TPO	NPU12229	Plasma—Thyroid peroxidase antibody; arbitrary substance concentration(procedure) = ? (p.d.u.)	P—Thyroid peroxidase antibody; arb.subst.c.(proc.) = ? (p.d.u.)	Plasma			Thyroid peroxidase antibody		arbitrary substance concentration	procedure	(p.d.u.)	Clinical Biochemistry	Ratio
196	52 kDa Ro protein antibody	NPU18242	Plasma—E3 ubiquitin-protein ligase TRIM21 antibody(IgG); arbitrary substance concentration (procedure) = ? (p.d.u.)	P—E3 ubiquitin-protein ligase TRIM21 antibody(IgG); arb.subst.c.(proc.) = ? (p.d.u.)	Plasma			E3 ubiquitin-protein ligase TRIM21 antibody	IgG	arbitrary substance concentration	procedure	(p.d.u.)	Clinical Immunology	Ratio
197	hCG beta chain	NPU01580	Plasma—Choriogonadotropin beta-chain; arbitrary substance concentration(IRP 75/551; procedure) = ? IU/L	P—Choriogonadotropin beta-chain; arb.subst.c.(IRP 75/551; proc.) = ? IU/L	Plasma			Choriogo-nadotropin beta-chain		arbitrary substance concentration	IRP 75/551; procedure	IU/L	Clinical Biochemistry	Ratio
198		NPU04153	Leukocytes(Blood)—Large unstained cells; number fraction = ?	Lkcs(B)—Large unstained cells; num.fr. = ?	Leuko-cytes	Blood		Large un-stained cells		number fraction			Clinical Biochemistry	Ratio
199	FSH	NPU18869	Plasma—Follitropin; arbitrary substance concentration (procedure) = ? (p.d.u.)	P—Follitropin; arb.subst.c.(proc.) = ? (p.d.u.)	Plasma			Follitropin		arbitrary substance concentration	procedure	(p.d.u.)	Clinical Biochemistry	Ratio
200		NPU13227	Plasma—Cat dander-epithelium antibody(IgE); arbitrary substance concentration(e1; procedure) = ? (p.d.u.)	P—Cat dander-epithelium antibody(IgE); arb.subst.c.(e1; proc.) = ? (p.d.u.)	Plasma			Cat dander-epithelium antibody	IgE	arbitrary substance concentration	e1; procedure	(p.d.u.)	Clinical Allergology	Ratio
201	CEA	NPU19719	Plasma—Carcinoembryonic antigen; mass concentration = ? µg/L	P—Carcinoembryonic antigen; mass c. = ? µg/L	Plasma			Carcino-embryonic antigen		mass concentration		µg/L	Clinical Biochemistry	Ratio

* '1' indicates the most frequent laboratory examination perfromed by Danish, Dutch, Norwegian and Swedish laboratories

** The content of this column has not been validated, and may solely be a help for the readers to find the exact laboratory examination. The trivial terms may vary between languages and cultures.j