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(Technical report 1997)

AND

INTERNATIONAL FEDERATION OF CLINICAL CHEMISTRY
SCIENTIFIC DIVISION
COMMITTEE OF NOMENCLATURE, PROPERTIES AND UNITS (C-NPU)#
(Recommendation 1997)

**PROPERTIES AND UNITS IN THE CLINICAL
LABORATORY SCIENCES:
Part IX. Properties and units in trace elements**

(Technical Report)
(IUPAC—IFCC 1997)

Prepared for publication by

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Properties and units in the clinical laboratory sciences: Part IX. Properties and units in trace elements (Technical Report)

Synopsis

This document is the first Technical report-recommendation on the presentation of trace elements and their values in clinical laboratory sciences from International Federation of Clinical Chemistry and International Union of Pure and Applied Chemistry. It forms part of the ongoing effort to standardise requests and reporting of laboratory data for transmission across cultural and linguistic domains, without attempting to standardise the routine language used by clinicians and laboratory practitioners.

Other documents deal with syntax, kinds-of-property, and properties and units used in other areas of clinical laboratory sciences.

The document is accessible on Internet from C-NPU Home page address:
http://inet.uni-c.dk/home/ifcc_iupac_cnpu/

Preface

This document is the result of cooperation between the Commission on Toxicology of the International Union of Pure and Applied Chemistry (IUPAC) and the Committee/Commission on Nomenclature, Properties and Units of the International Federation of Clinical Chemistry (IFCC) and IUPAC.

The document is the ninth part (IX) of a series on properties examined in the clinical laboratory sciences, initiated in 1987.

The series will comprise:

- I Syntax and semantic rules [1]
- II Kinds-of-property
- III Elements (of properties) and their code values
- IV Properties and their code values
- V Properties and units in Thrombosis and Haemostasis
- VI Properties and units in IOC prohibited Drugs
- VII Properties and units in Inborn Errors of Metabolism
- VIII Properties and units in Clinical Bacteriology
- IX Properties and units in Trace elements
- X Properties and units in General Clinical Chemistry
- XI Coding systems - structure and guidelines
- XII Properties and units in Clinical Pharmacology and Toxicology
- XIII Properties and units in Reproduction and Fertility
- XV WWW databases
- XVI Properties and units in Clinical Allergology

FOREWORD AND SCOPE

Basic research in biology and medicine and innovations in laboratory methodology have greatly increased the range of properties available to medical practitioners to help them in decisions on diagnosis, treatment and prevention of disease.

The plethora is now such that the individual physician has insight in or understanding of only a limited number of properties offered to him from the various clinical laboratory specialities.

In the laboratory, local terms (jargon) may be well understood among colleagues, but they are not appropriate for communication with the outside world. Likewise, a laboratory and its local community of users, such as hospital or community physicians, may use a "local dialect" of the language of clinical laboratory sciences which is well understood by all concerned, but when the communication possibilities are wider, even transnational, risks of serious misunderstanding arise.

In addition, the terminology used by one laboratory speciality may vary even within the speciality, and may be incomprehensible to another speciality. This is a minor inconvenience to the laboratory

specialities, each one essentially operating within its own area of activity. However, for the user this is highly unsatisfactory and also may hinder treatment of the patient.

It is therefore essential to promote clear, unambiguous, meaningful and fully informative communication. Also, coherence of statements made within and between medical specialities, and uniformity in structure of presentation are to be strived for. This will facilitate transfer of information across cultural, alphabetic and language areas.

The purpose of this document is to apply the IUPAC–IFCC recommended syntax structures [1] for request and report, providing formats and terms of properties examined in the domain of Trace Elements, in order to facilitate unequivocal written or electronic communication between health care professionals.

The list of properties shown in this document is not exhaustive; it is a collection of realistic examples.

STANDARDISED REQUEST AND REPORT OF CINICAL LABORATORY RESULTS

The parts of a request and a report are presented in Table 1.

Table 1. Standard systematic description

1	Identification and time
	1.1 identification of patient
	1.2 date and time(s) of sampling
2	Property
	2.1 system
	2.2 component
	2.3 kind-of-property
3	Result
	3.1 equality, inequality or other operator
	3.2 numerical value
	3.3 unit
4	Remarks

For definition of concepts, see [1]

Essential for a *request* are part 1 and 2 (Table 1), covering information on patient identification, time or time interval for sampling, and information on the property requested.

The laboratory *report* comprises the three subdivisions 1, 2 and 3.

To each element in part 2 may be added a specification as a parenthetic suffix for clarification and to avoid ambiguity.

Remarks (part 4) relating to diagnosis, medication, haemolysis or hardware breakdown are not included, except when needed for the interpretation of results.

Thus, the elements of a property comprise:

System(specification)—Component(specification); kind-of-property(specification)

This is as recommended by IFCC and IUPAC [2,3] and by the European pre standard ENV1614:1995 [4].

EXAMPLE

[NPU01589]

Plasma—Chromium(III); substance concentration

The elements of a result comprise: an operator (= < ≤ > ≥ etc.), a numerical value, and a coherent unit (both of the latter usually in symbolic form).

EXAMPLE

[NPU01273]

= 0,1 nmol/l (prefix n: nano = 10^{-9}).

The unit must never be omitted in reporting results, except for the unit '1'.

It is further recommended that the result includes or refers to a measure of uncertainty.

In addition to the systematic term of the property, an example and other pertinent information is given.

NOMENCLATURE

It is recommended that the component name be spelled out in full as elemental symbols may not always be known by medical specialists. The oxidation state of an element is given in Roman numerals following the name of the element when relevant.

ELEMENTS OF AN ENTRY IN THIS RECOMMENDATION

The terms recommended are given in bold, that is: the term for the type of property, the unit, and the coding scheme identifier with a code value.

- 1 **Name of system and parenthetic specification spelled out in full, and followed by a long dash.**
- 2 **Alphanumeric chemical prefixes to component name.**
- 3 **Recommended name of component and parenthetic specification. Shifted to the left for alphabetical sorting and searching, and followed by a semicolon.**
- 4 **Kind-of-property and parenthetic specification.**
- 5 **Unit.**
- 6 Molar mass *M* for conversion from mass-based kinds-of-property.
- 7 Authority: Code value for the international organisation recommending the component or the combined elements of an entry.
- 8 **[NPUXXXXX]**
Coding scheme identifier and code value, intended for interlaboratory transmission between databases.
- 9 Example in abbreviated form. For some, a numerical value for the result is included. It does not represent a reference value!

EXAMPLE

Plasma—
Aluminium;
substance concentration
micromole/litre
M = 26,98 g/mol
Authority: IUPAC/VII/C-TOX; CAS7429-90-5
[NPU01157]
P—Aluminium; subst.c. = 0,059 μ mol/l

The data reported per element are mainly taken from review articles and books on trace elements [4 -11].

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INDEX OF ABBREVIATIONS

CAS	Chemical Abstract Service
IFCC	International Federation of Clinical Chemistry
IUPAC	International Union of Pure and Applied Chemistry
SI	International System of Units
C-NPU	Committee/Commission on Nomenclature, Properties and Units
C-TOX	Commssion on Toxicology

LIST OF PROPERTIES IN TRACE ELEMENTS

Hair—
Aluminium;
substance content
micromole/kilogram
M = 26,98 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7429-90-5
 [NPU01156]
 Hair—Aluminium; subst.cont. = 100 µmol/kg

Plasma—
Aluminium;
substance concentration
micromole/litre
M = 26,98 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7429-90-5
 [NPU01157]
 P—Aluminium; subst.c. = 200 µmol/l

Urine—
Aluminium;
substance concentration
micromole/litre
M = 26,98 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7429-90-5
 [NPU01158]
 U—Aluminium; subst.c. = 0,059 µmol/l

Blood—
Antimony;
substance concentration
nanomole/litre
M = 121,75 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-36-0
 [NPU01271]
 B—Antimony; subst.c. = 0,1 nmol/l

Hair—
Antimony;
substance content
micromole/kilogram
M = 121,75 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-36-0
 [NPU01272]
 Hair—Antimony; subst.cont. = 2 µmol/kg

Plasma—
Antimony;
substance concentration
nanomole/litre
M = 121,75 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-36-0
 [NPU01273]
 P—Antimony; subst.c. = 0,1 nmol/l

Urine—
Antimony;
substance concentration
nanomole/litre
M = 121,75 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-36-0
 [NPU01274]
 U—Antimony; subst.c. = 12 nmol/l

Blood—
Arsenic;
substance concentration
nanomole/litre
 [NPU01306]
M = 74,92 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-38-2
 B—Arsenic; subst.c. = 35 nmol/l

Cells(Blood)—
Arsenic;
substance content
nanomole/kilogram
 [NPU04807]
M = 74,92 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-38-2
 Cells(B)—Arsenic; subst.cont. = 60 nmol/kg

Hair—
Arsenic;
substance content
micromole/kilogram
M = 74,92 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-38-2
 [NPU01307]
 Hair—Arsenic; subst.cont. = 10 µmol/kg

Plasma—
Arsenic;
substance concentration
nanomole/litre
M = 74,92 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-38-2
 [NPU04903]
 P—Arsenic; subst.c. = 15 nmol/l

Urine—
Arsenic;
substance concentration
nanomole/litre
M = 74,92 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-38-2
 [NPU01308]
 U—Arsenic; subst.c. = 1600 nmol/l

Plasma—
Barium;
substance concentration
nanomole/litre
M = 137,34 g/mol
 Authority: IUPAC/VII/C-TOX: CAS7440-39-3
 [NPU01346]
 P—Barium; subst.c. = 7 nmol/l

Urine—
Barium;
substance concentration
nanomole/litre
M = 137,34 g/mol
 Authority: IUPAC/VII/C-TOX: CAS7440-39-3
 [NPU01347]
 U—Barium; subst.c. = 35 nmol/l

Plasma—
Beryllium;
substance concentration
nanomole/litre
M = 9,01 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-41-7
 [NPU01364]
 P—Beryllium; subst.c. = 10 nmol/l

Urine—
Beryllium;
substance concentration
nanomole/litre
M = 9,01 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-41-7
 [NPU01365]
 U—Beryllium; subst.c. = 10 nmol/l

Plasma—
Bismuth;
substance concentration
nanomole/litre
M = 208,98 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-69-9
 [NPU01383]
 P—Bismuth; subst.c. = 0,3 nmol/l

Urine—
Bismuth;
substance concentration
nanomole/litre
M = 208,98 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-69-9
 [NPU01384]
 U—Bismuth; subst.c. = 2,5 nmol/l

Hair—
Boron;
substance content
micromole/kilogram
M = 10,81 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-42-8
 [NPU04808]
 Hair—Boron; subst.cont. = 400 µmol/kg

Plasma—
Boron;
substance concentration
micromole/litre
M = 10,811(5) g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-42-8
 [NPU01400]
 P—Boron; subst.c. = 2 µmol/l

Urine—
Boron;
substance concentration
micromole/litre
M = 10,81 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-42-8
 [NPU04809]
 U—Boron; subst.c. = 70 µmol/l

Blood—
Bromide;
substance concentration
micromole/litre
M = 79,90 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7726-95-6
 [NPU04834]
 B—Bromide; subst.c. = 60 µmol/l

Plasma—
Bromide;
substance concentration
micromole/litre
M = 79,90 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7726-95-6
 [NPU01403]
 P—Bromide; subst.c. = 60 µmol/l

Urine—
Bromide;
substance concentration
micromole/litre
M = 79,90 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7726-95-6
 [NPU04870]
 U—Bromide; subst.c. = 50 µmol/l

Blood—
Cadmium;
substance concentration
nanomole/litre
M = 112,41 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-43-9
 [NPU04874]
 B—Cadmium; subst.c. = 5 nmol/l

Cells(Blood)—
Cadmium;
substance content
nanomole/kilogram
M = 112,41 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-43-9
 [NPU04881]
 Cells(B)—Cadmium; subst.cont. = 10 nmol/kg

Hair—
Cadmium;
substance content
micromole/kilogram
M = 112,41 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-43-9
 [NPU01424]
 Hair—Cadmium; subst.cont. = 0,8 µmol/kg

Plasma—
Cadmium;
substance concentration
nanomole/litre
M = 112,41 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-43-9
 [NPU01425]
 P—Cadmium; subst.c. = 2 nmol/l

Urine—
Cadmium;
substance concentration
nanomole/litre
M = 112,41 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-43-9
 [NPU01426]
 U—Cadmium; subst.c. = 10 nmol/l

Blood—
Caesium;
substance concentration
nanomole/litre
M = 132,90 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-46-2
 [NPU01427]
 B—Caesium; subst.c. = 3,3 nmol/l

Cells(Blood)—
Caesium;
substance content
nanomole/kilogram
M = 132,90 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-46-2
 [NPU01428]
 Cells(B)—Caesium; subst.cont. = 0,04 nmol/kg

Hair—
Caesium;
substance content
micromole/kilogram
M = 132,90 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-46-2
 [NPU01429]
 Hair—Caesium; subst.cont. = 2,6 µmol/kg

Plasma—
Caesium;
substance concentration
nanomole/litre
M = 132,90 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-46-2
 [NPU01430]
 P—Caesium; subst.c. = 6 nmol/l

Urine—
Caesium;
substance concentration
nanomole/litre
M = 132,90 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-46-2
 [NPU01431]
 U—Caesium; subst.c. = 100 nmol/l

Cells(Blood)—
Chromium(III);
substance content
nanomole/kilogram
M = 52,00 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-47-3
 [NPU01586]
 Cells(B)—Chromium(III);subst.cont. = 6 nmol/kg

Hair—
Chromium(III);
substance content
micromole/kilogram
M = 52,00 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-47-3
 [NPU01588]
 Hair—Chromium(III);subst.cont. = 90 µmol/kg

Plasma—
Chromium(III);
substance concentration
nanomole/litre
M = 52,00 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-47-3
 [NPU01589]
 P—Chromium(III);subst.c. = 4 nmol/l

Urine—
Chromium(III);
substance concentration
nanomole/litre
M = 52,00 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-47-3
 [NPU01590]
 U—Chromium(III);subst.c. = 10 nmol/l

Air(specification)—
Chromium(VI);
substance concentration
micromole/(metre)³
M = 52,00 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-47-3
 [NPU01591]
 Air(spec.)—Chromium(IV);subst.c. = 0,96 µmol/m³

[NPU01702]
Air(specification)—
Cobalt;
substance concentration
micromole/(metre)³
 Air(spec.)—Cobalt; subst.c. = 0,84 µmol/m³
M = 58,93 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-48-4

Blood—
Cobalt;
substance concentration
nanomole/litre
M = 58,93 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-48-4
 [NPU01703]
 B—Cobalt; subst.c. = 2 nmol/l

Hair—
Cobalt;
substance content
micromole/kilogram
M = 58,93 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-48-4
 [NPU01704]
 Hair—Cobalt; subst.cont. = 2,3 µmol/kg

- Plasma—**
Cobalt;
substance concentration
nanomole/litre
M = 58,93 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-48-4
[NPU04904]
 P—Cobalt; subst.c. = 2 nmol/l
- Urine—**
Cobalt;
substance concentration
nanomole/litre
M = 58,93 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-48-4
[NPU01705]
 U—Cobalt; subst.c. = 25 nmol/l
- Cells(Blood)—**
Copper;
substance content
micromole/kilogram
M = 63,55 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-50-8
[NPU04905]
 Cells(B)—Copper; subst.cont. = 10 µmol/kg
- Hair—**
Copper;
substance content
micromole/kilogram
M = 63,55 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-50-8
[NPU01772]
 Hair—Copper; subst.cont. = 200 µmol/kg
- Plasma—**
Copper;
substance concentration
micromole/litre
M = 63,55 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-50-8
[NPU01773]
 P—Copper; subst.c. = 17 µmol/l
- Urine—**
Copper;
substance concentration
micromole/litre
M = 63,55 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-50-8
[NPU01774]
 U—Copper; subst.c. = 0,4 µmol/l
- Plasma—**
Fluoride;
substance concentration
micromole/litre
M = 19,00 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7782-41-4
[NPU04882]
 U—Fluoride; subst.c. = 1 µmol/l
- Hair—**
Gold;
substance content
nanomole/kilogram
M = 196,97 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-57-5
[NPU02311]
 Hair—Gold; subst.cont. = 100 nmol/kg
- Plasma—**
Gold;
substance concentration
picomole/litre
M = 196,97 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-57-5
[NPU02312]
 P—Gold; subst.c. = 33 pmol/l
- Urine—**
Gold;
substance concentration
picomole/litre
M = 196,97 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-57-5
[NPU02313]
 U—Gold; subst.c. = 60 pmol/l
- Urine—**
Iodide;
substance concentration
micromole/litre
M = 126,90 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7553-56-2
[NPU04884]
 U—Iodide; subst.c. = 5 µmol/l
- Hair—**
Iron;
substance content
micromole/kilogram
M = 55,85 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-89-6
[NPU02506]
 Hair—Iron; subst.cont. = 130 µmol/kg
- Plasma—**
Iron;
substance concentration
micromole/litre
M = 55,85 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-89-6
[NPU02508]
 P—Iron; subst.c. = 21 µmol/l
- Urine—**
Iron;
substance concentration
micromole/litre
M = 55,85 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-89-6
[NPU03940]
 U—Iron; subst.c. = 4 µmol/l

Blood—

Lead;
substance concentration
micromole/litre
M = 207,2 g/mol
 Authority: IUPAC VII/C-TOX; CAS7439-92-1
 [NPU02572]
 B—Lead; subst.c. = 0,50 µmol/l

Cells(Blood)—

Lead;
substance content
micromole/kilogram
M = 207,2 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-92-1
 [NPU02573]
 Cells(B)—Lead; subst.cont. = 1 µmol/kg

Hair—

Lead;
substance content
micromole/kilogram
M = 207,2 g/mol
 Authority: IUPAC VII/C-TOX; CAS7439-92-1
 [NPU02574]
 Hair—Lead; subst.cont. = 160 µmol/kg

Plasma—

Lead;
substance concentration
micromole/litre
M = 207,2 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-92-1
 [NPU04887]
 P—Lead; subst.c. = 0,02 :mol/l

Urine—

Lead;
substance concentration
micromole/litre
M = 207,2 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-92-1
 [NPU02575]
 U—Lead; subst.c. = 0,3 µmol/l

Hair—

Lithium ion;
substance content
micromole/kilogram
M = 6,94 g/mol
 Authority: IUPAC/VII/C-TOX
 [NPU02612]
 Hair—Lithium ion; subst.cont. = 56 µmol/kg

Plasma—

Lithium ion;
substance concentration
millimole/litre
M = 6,94 g/mol
 Authority: IUPAC/VII/C-TOX
 [NPU02613]
 P—Lithium ion; subst.c. = 0,10 mmol/l

Urine—

Lithium ion;
substance concentration
micromole/litre
M = 6,94 g/mol
 Authority: IUPAC/VII/C-TOX
 [NPU04888]
 U—Lithium ion; subst.c. = 2,4 µmol/l

Plasma—

Magnesium(II; total);
substance concentration
millimole/litre
M = 24,30 g/mol
 Authority: IFCC/C-BGE; IUPAC/VII/C-TOX;
 [NPU02647]
 P—Magnesium(II; total); subst.c. = 1,0 mmol/l
 AS7439-95-4

Urine—

Magnesium(II; total);
substance concentration
millimole/litre
M = 24,30 g/mol
 Authority: IFCC/C-BGE; IUPAC/VII/C-TOX;
 [NPU02648]
 U—Magnesium(II; total); subst.c. = 10 mmol/l
 AS7439-95-4

Blood—

Manganese;
substance concentration
nanomole/litre
M = 54,94 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-96-5
 [NPU02668]
 B—Manganese; subst.c. = 140 nmol/l

Cells(Blood)—

Manganese;
substance content
nanomole/kilogram
M = 54,94 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-96-5
 [NPU04891]
 Cells(B)—Manganese; subst.cont. = 300 nmol/kg

Plasma—

Manganese;
substance concentration
nanomole/litre
M = 54,94 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-96-5
 [NPU02669]
 P—Manganese; subst.c. = 10 nmol/l

Urine—

Manganese;
substance concentration
nanomole/litre
M = 54,94 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-96-5
 [NPU02670]
 U—Manganese; subst.c. = 20 nmol/l

- Blood—**
Mercury;
substance concentration
nanomole/litre
M = 200,59 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-97-6
 [NPU02699]
 B—Mercury; subst.c. = 25 nmol/l
- Cells(Blood)—**
Mercury;
substance content
nanomole/kilogram
M = 200,59 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-97-6
 [NPU04893]
 Cells(B)—Mercury; subst.cont. = 30 nmol/kg
- Hair—**
Mercury;
substance content
micromole/kilogram
M = 200,59 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-97-6
 [NPU02700]
 Hair—Mercury; subst.cont. = 40 µmol/kg
- Plasma—**
Mercury;
substance concentration
nanomole/litre
M = 200,59 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-97-6
 [NPU02701]
 P—Mercury; subst.c. = 10 nmol/l
- Urine—**
Mercury;
substance concentration
nanomole/litre
M = 200,59 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-97-6
 [NPU02702]
 U—Mercury; subst.c. = 10 nmol/l
- Hair—**
Molybdenum;
substance content
micromole/kilogram
M = 95,94 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-98-7
 [NPU02837]
 Hair—Molybdenum; subst.cont. = 6 µmol/kg
- Plasma—**
Molybdenum;
substance concentration
nanomole/litre
M = 95,94 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-98-7
 [NPU02838]
 P—Molybdenum; subst.c. = 7 nmol/l
- Urine—**
Molybdenum;
substance concentration
nanomole/litre
M = 95,94 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7439-98-7
 [NPU02839]
 U—Molybdenum; subst.c. = 300 nmol/l
- Hair—**
Nickel;
substance content
micromole/kilogram
M = 58,71 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-02-0
 [NPU02905]
 Hair—Nickel; subst.cont. = 54 µmol/kg
- Plasma—**
Nickel;
substance concentration
nanomole/litre
M = 58,71 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-02-0
 [NPU02906]
 P—Nickel; subst.c. = 5 nmol/l
- Urine—**
Nickel;
substance concentration
nanomole/litre
M = 58,71 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-02-0
 [NPU02907]
 U—Nickel; subst.c. = 30 nmol/l
- Plasma—**
Platinum;
substance concentration
picomole/litre
M = 195,09 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-06-4
 [NPU03204]
 P—Platinum; subst.c. = 20 pmol/l
- Urine—**
Platinum;
substance concentration
picomole/litre
M = 195,09 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-06-4
 [NPU03205]
 U—Platinum; subst.c. = 50 pmol/l
- Blood—**
Rubidium;
substance concentration
micromole/litre
M = 85,47 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-17-7
 [NPU03370]
 B—Rubidium; subst.c. = 25 µmol/l

- Cells(Blood)—**
Rubidium;
substance content
micromole/kilogram
M = 85,47 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-17-7
 [NPU04894]
 Cells(B)—Rubidium; subst.cont. = 50 µmol/kg
- Hair—**
Rubidium;
substance content
micromole/kilogram
M = 85,47 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-17-7
 [NPU03371]
 Hair—Rubidium; subst.cont. = 4 µmol/kg
- Plasma—**
Rubidium;
substance concentration
micromole/litre
M = 85,47 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-17-7
 [NPU03372]
 P—Rubidium; subst.c. = 2 µmol/l
- Urine—**
Rubidium;
substance concentration
micromole/litre
M = 85,47 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-17-7
 [NPU03373]
 U—Rubidium; subst.c. = 30 µmol/l
- Plasma—**
Scandium;
substance concentration
micromole/litre
M = 44,95 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-20-2
 [NPU04896]
 P—Scandium; subst.c. = 38 µmol/l
- Blood—**
Selenium;
substance concentration
micromole/litre
M = 78,96 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7782-49-2
 [NPU03893]
 B—Selenium; subst.c. = 1,5 µmol/l
- Cells(Blood)—**
Selenium;
substance content
micromole/kilogram
M = 78,96 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7782-49-2
 [NPU03405]
 Cells(B)—Selenium; subst.cont. = 2 µmol/kg
- Hair—**
Selenium;
substance content
micromole/kilogram
M = 78,96 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7782-49-2
 [NPU04899]
 Hair—Selenium; subst.cont. = 25 µmol/kg
- Plasma—**
Selenium;
substance concentration
micromole/litre
M = 78,96 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7782-49-2
 [NPU04900]
 P—Selenium; subst.c. = 2 µmol/l
- Urine—**
Selenium;
substance concentration
micromole/litre
M = 78,96 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7782-49-2
 [NPU03406]
 U—Selenium; subst.c. = 1,3 µmol/l
- Plasma—**
Silicon;
substance concentration
micromole/litre
M = 28,09 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-21-3
 [NPU03423]
 P—Silicon; subst.c. = 5 µmol/l
- Urine—**
Silicon;
substance concentration
micromole/litre
M = 28,09 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-21-3
 [NPU03424]
 U—Silicon; subst.c. = 500 µmol/l
- Blood—**
Silver;
substance concentration
nanomole/litre
M = 107,87 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-22-4
 [NPU03891]
 B—Silver; subst.c. = <20 nmol/l
- Hair—**
Silver;
substance content
micromole/kilogram
M = 107,87 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-22-4
 [NPU03890]
 Hair—Silver; subst.cont. = 3 µmol/kg

- Plasma—**
Silver;
substance concentration
nanomole/litre
M = 107,87 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-22-4
 [NPU03425]
 P—Silver; subst.c. = 1 nmol/l
- Urine—**
Silver;
substance concentration
nanomole/litre
M = 107,87 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-22-4
 [NPU03892]
 U—Silver; subst.c. = 10 nmol/l
- Cells(Blood)—**
Strontium;
substance content
nanomole/kilogram
M = 87,62 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-24-6
 [NPU04901]
 Cells(B)—Strontium; subst.cont. = 30 nmol/kg
- Plasma—**
Strontium;
substance concentration
nanomole/litre
M = 87,62 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-24-6
 [NPU03494]
 P—Strontium; subst.c. = 0,3 nmol/l
- Blood—**
Thallium;
substance concentration
nanomole/litre
M = 204,37 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-28-0
 [NPU03551]
 B—Thallium; subst.c. = 2 nmol/l
- Urine—**
Thallium;
substance concentration
nanomole/litre
M = 204,37 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-28-0
 [NPU03553]
 U—Thallium; subst.c. = 3 nmol/l
- Plasma—**
Tin;
substance concentration
nanomole/litre
M = 118,69 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-31-5
 [NPU03582]
 P—Tin; subst.c. = 7 nmol/l
- Plasma—**
Titanium;
substance concentration
micromole/litre
M = 47,90 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-32-6
 [NPU04902]
 P—Titanium; subst.c. = 2 µmol/l
- Blood—**
Uranium;
substance concentration
picomole/litre
M = 238,03 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-61-1
 [NPU03685]
 B—Uranium; subst.c. = 21 pmol/l
- Urine—**
Uranium;
substance concentration
picomole/litre
M = 238,03 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-61-1
 [NPU03686]
 U—Uranium; subst.c. = 42 pmol/l
- Hair—**
Vanadium;
substance content
micromole/kilogram
M = 50,94 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-62-2
 [NPU03736]
 Hair—Vanadium; subst.cont. = 1,4 µmol/kg
- Plasma—**
Vanadium;
substance concentration
nanomole/litre
M = 50,94 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-62-2
 [NPU03737]
 P—Vanadium; subst.c. = 0,6 nmol/l
- Urine—**
Vanadium;
substance concentration
nanomole/litre
M = 50,94 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-62-2
 [NPU03738]
 U—Vanadium; subst.c. = 6 nmol/l
- Cells(Blood)—**
Zinc;
substance content
micromole/kilogram
M = 65,38 g/mol
 Authority: IUPAC/VII/C-TOX; CAS7440-66-6
 [NPU03767]
 Cells(B)—Zinc; subst.cont. = 155 µmol/kg

Plasma—**Zinc;****substance concentration****micromole/litre***M* = 65,38 g/mol

Authority: IUPAC/VII/C-TOX; CAS7440-66-6

[NPU03768]

P—Zinc; subst.c. = 14 µmol/l

Seminal plasma—**Zinc;****substance concentration****micromole/litre***M* = 65,38 g/mol

Authority: IUPAC/VII/C-TOX; CAS7440-66-6

[NPU03769]

Seminal plasma—Zinc; subst.c. = 2 000 µmol/l

Urine—**Zinc;****substance concentration****micromole/litre***M* = 65,38 g/mol

Authority: IUPAC/VII/C-TOX; CAS7440-66-6

[NPU03770]

U—Zinc; subst.c. = 5 µmol/l