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PURE AND APPLIED CHEMISTRY

AND

INTERNATIONAL FEDERATION OF
CLINICAL CHEMISTRY

IUPAC SECTION ON CLINICAL CHEMISTRY
COMMISSION ON QUANTITIES AND UNITS
AND
IFCC COMMITTEE ON STANDARDS
EXPERT PANEL ON QUANTITIES AND UNITS

LIST OF QUANTITIES IN CLINICAL CHEMISTRY

RECOMMENDATION 1973

Prepared for publication by
R. Dybkær
Department of Clinical Chemistry, Geriatric Unit, De Gamles By, Nørre Allé 41, DK-2200 Copenhagen N, Denmark

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PREFACE

The Commission on Quantities and Units in Clinical Chemistry* is a part of the Section on Clinical Chemistry of the International Union of Pure and Applied Chemistry (IUPAC). The Expert Panel on Quantities and Units† is a part of the Committee on Standards of the International Federation of Clinical Chemistry (IFCC). These two bodies, the Commission and the Expert Panel, have worked jointly on this document—the former mainly concerned with basic philosophy, the latter with problems of implementation.

The aim of this document is to serve as a guide in supplanting present vernacular names for measurable properties in clinical chemistry. Systematic and more informative names are recommended, based on chemical and biochemical nomenclature. At the same time, a preference for 'molecular' kinds of quantities and SI units is stressed.

The tentative version of the present publication appeared as a IUPAC–IFCC (yellow) *Information Bulletin*, Appendices on Tentative Nomenclature, Symbols, Units, and Standards, No. 21, February 1972. As a consequence of comments from knowledgeable colleagues and reconsiderations by the Commission and Expert Panel a few minor changes have been made for this Recommendation 1973.

IUPAC has approved this Recommendation 1973. The IFCC Committee on Standards and Executive Board have also approved, but the document still needs the confirmation of the IFCC Council.

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* *Titular Members:* B. H. Armbrecht (Beltsville, USA) 1967–73; R. Dybkaer, *Chairman* (Copenhagen, Denmark) 1967–73; R. Herrmann (Giessen, German Federal Republic) 1971–73; K. Jørgensen (Copenhagen, Denmark) 1967–73; P. Métais (Strasbourg, France) 1967–73.

† *Titular Members:* As above.

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CONTENTS

ABBREVIATIONS OF REFERENCES

CQUCC	Commission on Quantities and Units in Clinical Chemistry
EPQU	Expert Panel on Quantities and Units
ICSH	International Committee for Standardization in Hematology
IFCC	International Federation of Clinical Chemistry
INN	International Non-Proprietary Name
IUB	International Union of Biochemistry
IUPAC	International Union of Pure and Applied Chemistry
NFN	Det nordiske Farmakopénævn
QU-R66	Quantities and Units in Clinical Chemistry. Recommendation 1966 (IUPAC–IFCC) (8.2)
WAPS	World Association of (Anatomic and Clinical) Pathology Societies

0. INTRODUCTION

0.1.—In 1967 a monograph (8.2) (QU-R66) appeared containing a *Recommendation 1966* of the Commission on Clinical Chemistry of the International Union of Pure and Applied Chemistry (IUPAC) and of the International Federation of Clinical Chemistry (IFCC). Since then, the work has been continued by the Commission on Quantities and Units in Clinical Chemistry (CQUCC) of IUPAC and by the Expert Panel on Quantities and Units (EPQU) of IFCC (cf. footnotes on p. 549). A condensed and revised version of QU-R66 is printed as a separate Recommendation (8.5).

0.2.—Concerning names of clinical chemical quantities, the *Recommendation 1966* stated (QU-R66-6.3.1) that *the generic part of the quantity name be unambiguous and contain the following three segments of information:*

kind of system of which a component or function is measured, e.g. Serum

component, e.g. Sodium ion

kind of quantity, e.g. 'molar concentration', now called substance concentration (cf. 5.2.1).

This statement is now supported by a joint Recommendation 1972 from ICSH, IFCC, and WAPS (8.3).

0.3.—On the basis of a thorough discussion (QU-R66-2.3) it was also stated in the *Recommendation 1966* (QU-R66-4.6) that the kind of quantity *amount of substance* is of 'central importance in clinical chemistry'. Consequently, this basic kind of quantity (measured in mole) and derived kinds of quantities, e.g. substance concentration and mole fraction, are preferred for mass, mass concentration, mass fraction, respectively. This recommendation is now also joint ICSH, IFCC, and WAPS (8.3).

0.4.—These principles, supplemented by some suggested rules, were applied to compile a List of Quantities (QU-R66-7) where the complete systematic names of one hundred quantities were given as examples for discussion.

0.5.—The present new list of names is the outcome of further deliberations in CQUCC and EPQU and also incorporates various suggestions from other sources as well as developments in international nomenclature since 1966.

1. SCOPE OF LIST

The quantities listed are meant to cover many, but not all, of those measured today in clinical chemical laboratories. It is hoped that names for quantities omitted from the list may be created easily from analogous entries. Not every example is necessarily clinically relevant.

Methods of reporting loading test results, e.g. 'glucose tolerance', are not specifically given. They may contain information on the procedure followed and a table or graph of paired results for time and clinical chemical quantity.

As many clinical chemical laboratories are concerned also with determination of hematological, clinical physiological, clinical microbiological and toxicological quantities, some of these are included.

2. STRUCTURE OF LIST

2.1.—Each entry is given an alpha-numeric serial reference, e.g. B17, for convenience of identification in this document.

2.2.—The general form of an entry is according to *Recommendation 1966* (QU-R66-3.1-1)

$$\text{quantity} = \text{number} \times \text{unit}$$

2.3.—Most of the quantity names listed have the recommended information arranged in the following form

System—Component, kind of quantity

Specifications in parentheses may be necessary to one or more of the three segments. More complex types of names occur, e.g. [A02, A13].

2.4.—The quantities are listed alphabetically according to the component that, arbitrarily, has been printed in small capitals.

2.5.—The value for each quantity is meant to represent a result from a 'normal' adult person.

2.6.—A set of printing rules is given in *Recommendation 1966* (QU-R66-3.8). The special problems inherent in the use of typewriters with restricted sets of characters have not been treated.

3. SYSTEMS

3.1.—The system employed is supposed to be a certain 'normal' person or a part of same (e.g. Blood, Leukocytes, Bilirubins) or some material the person takes up or excretes (e.g. Food, Faeces). Occasionally, a measuring system is used [C13].

3.2.—The following codes are used in this document (for others, cf. 8.5).

Table 3.2-1. Codes for description of system

B	Blood (in vessels)
aB	Arterial blood (in arterial vessels; including 'capillary blood')
vB	Venous blood (in venous vessels)
d	24-hour (change of system during 24 hours)
fPt	Fasting patient (measurement in the morning)
F	Faeces
P	Plasma (blood plasma)
Pt	'Patient' (individual on whom measurement is being made)
S	Serum (blood serum)
Sf	Spinal fluid
U	Urine

Too many abbreviations and codes should be avoided and, in case of doubtful comprehensibility, the full name of the system should be given.

It may be necessary to indicate that the system of the quantity is part of a supersystem: (aB)P means that the plasma of the quantity is derived from arterial blood [D04].

When specifications are necessary, they are placed in parentheses after the system [D03, E04].

3.3.—The calendar time of obtaining the specimen should be a part of the identification of the person as well as other relevant information on technique of obtaining the specimen plus the physiological state of the person. That the specimen was obtained in the morning and that the person was fasting is symbolized fPt. Thus, (fPt)S or ((fPt)B)S means that the serum of the quantity is derived from blood of the fasting person in the morning [A17].

The time (interval) during which a registered change occurred in a system is coded in one situation: d for change during 24 hours = 1 d (morning to morning) [A18]. In other cases, the calendar time interval should be specified, e.g. after the kind of quantity.

4. COMPONENTS

4.1.—Names of components should be printed in full.

4.2.—The following types of components may be distinguished:

4.2.1.—*Definable chemical* components or *groups of such* are built of characteristic steric structures which may be symbolized by a chemical formula or common elementary entity, e.g. Carbamide, $CO(NH_2)_2$; Amino acid nitrogen, N.

4.2.2.—*Functional chemical* components are chemical compounds or groups of compounds characterized by common properties or effects, e.g. Alkaline phosphatase.

4.2.3.—*Physical* components are composed of micro- or macroscopic physical bodies, which constitute particles or phases in the system, e.g. Erythrocytes.

4.2.4.—Chemical or physiological processes may serve as components, e.g. Coagulation, Capillary bleeding [C34, C09].

4.3.1.—Chemical names are in accordance with IUPAC recommendations.

4.3.2.—Sodium is the name of the metallic element with atomic number 11 and oxidation number zero. This component is not found in biological systems, whereas *Sodium ion* is present.

4.3.3.—If doubt may arise as to oxidation number the *Stock notation* is employed using Roman numerals in parentheses. Thus, Calcium(II) signifies calcium with oxidation number + II irrespective of whether it be free ion Ca^{2+} or different kinds of chelated calcium(II) with ionization charges more difficult to define [C04, C05, C06, C07].

4.3.4.—*Roman numerals* are sometimes used for other kinds of specifications to the component name, e.g. for porphyrins or coagulation factors [U11, C35].

4.3.5.—Trivial chemical names have often been chosen for brevity instead of systematic chemical names. Where several trivial names exist for a substance the more 'chemical', i.e. the more informative, is given, e.g. carbamide for urea [C10].

4.3.6.—Prefixes defining stereoisomeric structure are omitted if not essential, e.g. Glucose for D-Glucose.

4.4.—For *drugs*, the names from national or, preferably, international pharmacopoeas should be used (NFN, INN).

4.5.—Enzymes are given Recommended Names according to the *Recommendation 1972* from International Union of Biochemistry (8.1) [A09].

4.6.—Blood cells are named according to suggestions by the Working Group on Standardized Documentation of Hematological Findings of the Expert Panel on Hematological Documentation under the International Committee for Standardization in Hematology (ICSH) [B08, E01, P08]. This nomenclature is not yet accepted by ICSH, but seems short, logical, and directly understandable.

4.7.—Taxonomic names for *families* and *genera* are printed in italics [M16].

4.8.—For *acids and bases,* defined according to Brønsted, the totality of corresponding acid–base pairs or series are often considered as one group. No accepted rules exist for naming such mixtures. The following rules are recommended:

4.8.1.—The designation of the maximally ionized form of those in question is given, omitting the word 'ion'. Thus, Ammonium [A25] comprises ammonium ion and ammonia; Creatininium [C47] comprises creatininium ion and creatinine; Ascorbate [A33] comprises ascorbate ion and ascorbic acid; Carbonate [C18] comprises carbonate ion, hydrogen carbonate ion, and carbonic acid, but *not* carbon dioxide. It should be noted that, in contrast to Ammonia and Ascorbic acid, the designations Ammonium and Ascorbate do not indicate single well-defined, chemical compounds.

4.8.2.—Trivial names for organic ampho-ionic substances having trivial names are used for the totality of the ampho-ionic, acid, and base forms. E.g. Hydroxyproline [H22] means hydroxyprolinium ion plus Hydroxyproline (non-charged) plus Hydroxyprolinate ion.

4.8.3.—Mixtures of a defined chemical component and its derivatives may be denoted by the plural form of the name of the pure substance [B13, C30].

4.9.—The bare component name may have to be further *specified* in parentheses to avoid ambiguity.

The elementary entity [C37, P02] or relative molecular mass [C05, T06] is often necessary information. The latter alternative is especially useful for proteins where the structure is not known in detail, and where the use of mass concepts also needs specification. For mixtures of substances limits may be specified [A17, A18, C35, U11]. To indicate the sum of components, specified in individual quantities, the specification 'total' may be applied [C08]. Also, specifications relating to a physiological process in which the

substance participates may be needed [D05].

4.10.—In many cases, several equally correct names are possible for the same component [A21, N08] [C04, C08]. Which one is preferred depends on the context.

5. KINDS OF QUANTITIES

5.1.—The kinds of quantities used are those given in *Recommendation 1966* with amendments and additions based on recent IUPAC and IUB recommendations, and approved by CQUCC and EPQU (cf. 8.5).

5.2.1.—The English designation 'molar' is now restricted by IUPAC to kinds of quantities with a definition containing the expression 'an extensive kind of quantity of the system divided by amount of substance of the system'. Consequently, 'molar concentration' is no longer acceptable; the systematic name is a cumbersome 'amount of substance concentration' or 'concentration' (8.4). However, after consultation with IUPAC Commission on Symbols, Terminology, and Units it was agreed that CQUCC can recommend the name 'substance concentration' to avoid confusion with the word 'concentration' in the colloquial sense.

5.2.2.—The IUPAC–IUB Recommendations 1972 (8.1) contain recent changes in some of the names and definitions for kinds of quantities and units in enzymology. They define the derived kind of quantity 'enzymic activity' as 'the rate of reaction of substrate that may be attributed to catalysis by an enzyme' and have the derived unit 'katal' = 1 mol/s. This approach creates dimensional difficulties (8.5) and, after much discussion, CQUCC and EPQU have decided to retain the former suggestion of 'catalytic amount' considered as a basic kind of quantity with a base unit 'katal', symbolized kat and defined as the catalytic amount of any catalyst (including any enzyme) that catalyses a reaction rate of one mole per second in an assay system. It should be stressed that numerical values are identical whether one uses the basic kind of quantity 'catalytic amount' and base unit 'katal' or the derived kind of quantity 'enzymic activity' and derived unit 'katal' = 1 mol/s. The use of the 'enzyme unit' (symbolized U) $\triangleq$ 1 μmol/min should be progressively discouraged. For a given method 1 U $\triangleq$ 16,67 nkat. The derived kind of quantity 'catalytic concentration' (CBN: concentration of enzymic activity) uses the non-coherent unit kat/l; 1 U/ml $\triangleq$ 16,67 μkat/l.

5.2.3.—CQUCC in Washington, DC, 1971, decided that the kind of quantity 'number of particles' (QU-R66-4.5) be renamed 'number (of entities)'. In accordance, 'particle concentration' (QU-R66-4.14) and the ambiguous 'particle fraction' (QU-R66-4.15) were renamed 'number concentration' and 'number fraction' respectively.

5.3.—A few recommended kinds of quantities that have not been systematically described by CQUCC are used in the List with recent modifications.

5.3.1.—*Volume content* (QU-R66-5.1. Specific volume content) is the volume of the isolated component at specified conditions divided by the mass of the system [B16].

5.3.2.—*Mean substance rate* (QU-R66-5.5. Mole rate) is the amount of substance of the component changed in or moved to or from a system divided by the time during which the component was changed or moved [cf. D05].

5.3.3.—*Mean volume rate* (QU-R66-5.4. Volume rate) is defined analogously with 5.3.2, substituting 'volume' for 'amount of substance' [F03].

5.4.1.—For so-called *qualitative tests,* a quantitative expression is used, employing a kind of quantity of an arbitrary nature (QU-R66-4.26). The two possible numerical values are given as specification to the kind of quantity: (0–1) [A27]. The symbols + and − are not recommended. (Cf. also 5.7.1 and 5.7.3.)

5.4.2.—Another, equally acceptable possibility is the use of, e.g., 'substance concentration' without specifications and a result showing whether the quantity is larger than or smaller than the substance concentration indicating the methodological limit of detection, e.g. Urine—Glucose, substance concentration < 12 mmoll instead of 0.

5.5.—So-called *semiquantitative tests* are quantitative and should be treated as such [B14], cf. also 5.7.3.

5.6.1.—In the List, all names of kind of quantity are given *unabbreviated.* If it be necessary to save space, the following three possibilities may be considered.

5.6.2.—The name of the kind of quantity may be *omitted with reference to a local rule, provided that misunderstandings are impossible in practice.* E.g. Plasma—Glucose = 8,2 mmol/l would be permissible if the data sheet states that: (i) the kind of quantity employed is given in the local laboratory manual or (ii) all results in 'mmol/l' refer to the kind of quantity 'substance concentration'.

5.6.3.—The kind of quantity may be given as its recommended symbol (cf. QU-R66-4). E.g. Plasma—Glucose, c = 8,2 mmol/l. All these symbols are in italics (underlined in typewritten text). The meaning of the symbols may be printed on the data sheet or in the laboratory manual.

5.6.4.—The name for the kind of quantity is suitably abbreviated, cf. QU-R66-7.3-2, substituting 'substc.' for 'molc.' as abbreviation for '(amount of) substance concentration'.

5.7.1.—*Specifications* are given in parentheses. The specific form shown is short, but should not be taken as a recommendation.

5.7.2.—For some kinds of quantities, the method used is a necessary specification: (i) kinds of quantities of an arbitrary nature; (ii) kinds of quantities relating to a component characterized by its function, e.g. an enzyme.

In other cases the inclusion or omission of the method is a matter of judgement about the dependence of the results on the current method(s).

5.7.3.—If results are restricted to a scale of integers, the closed interval of possible results should be stated, cf. 5.4.1 and 5.5 [A27, B14].

5.7.4.—In the case of quantities involving 'concentration' in liquids, the temperature of the system has been omitted because it is considered not to be sufficiently important.

5.7.5.—In practice, specifications should be adapted to local needs. A number referring to the laboratory manual, which contains all relevant information, is the shortest specification possible.

6. NUMBERS

6.1.—The numbers given in the List (value of quantity divided by unit) serve as illustrations and, presumably, contain only significant figures in accordance with the rule that the analytical disturbance should influence only the last figure.

6.2.—For some 'arbitrary' quantities, the result is always an integer, including 'zero', cf. 5.4.1 and 5.5 [A27].

6.3.—Where method is decisive for the magnitude of the result, the number is supplanted by a question mark, e.g. in the case of enzymes [A02].

7. UNITS

7.1.—In each case, the size of the unit has been chosen in accordance with the biological level and the estimated analytical variation of the result. Only factors that are 10^{3n}, where n is an integer, should be used.

The units kat, kat/l, and kat/mol are used for enzymes throughout for the reason stated in 6.3, but in most cases sub-units will be required.

7.2.—Quantities having the dimension one use the base unit 'unity' (1) and one of the units 10^{3n} is given, e.g. 1 or 10^{-3} [A07, B06].

7.3.—As a consequence of IUPAC recommendations (8.4) the following *deviations from QU-R66* have been made:

7.3.1.—'Thermodynamic temperature' and 'temperature difference' are given in the base unit kelvin (K), not in degree Kelvin (°K) [R01, F08].

7.3.2.—'Pressure' and 'partial pressure' use the unit pascal (Pa), which is identical with 'newton per square metre' (N/m^2) [B17].

8. REFERENCES

(Abbreviations, see p. 551)

8.1. Commission on Biochemical Nomenclature of the IUPAC and the IUB, *Enzyme Nomenclature. Recommendations (1972) on the Nomenclature and Classification of Enzymes together with their Units and the Symbols of Enzyme Kinetics*, 443 pp, Elsevier: Amsterdam (1973).

8.2. R. Dybkær and K. Jørgensen, *Quantities and Units in Clinical Chemistry Including Recommendation 1966 of the Commission on Clinical Chemistry of the IUPAC and of the IFCC*, x + 102 pp, Munksgaard: Copenhagen (1967).

8.3. International Committee for Standardization in Hematology, International Federation of Clinical Chemistry and World Association of (Anatomic and Clinical) Pathology Societies: Recommendation for Use of SI in Clinical Laboratory Measurements (1972). (See, e.g., *Z. klin. Chem.*, **11**, 93 (1973) (only).)

8.4. International Union of Pure and Applied Chemistry, Division of Physical Chemistry, Commission on Symbols, Terminology, and Units, *Manual of Symbols and Terminology for Physicochemical Quantities and Units*, 44 pp, Butterworths: London (1970). (Also in: *Pure and Appl. Chem.*, **21**, 1–44 (1970).)

8.5. International Union of Pure and Applied Chemistry, Section on Clinical Chemistry, Commission on Quantities and Units and International Federation of Clinical Chemistry, Committee on Standards, Expert Panel on Quantities and Units, *Quantities and Units in Clinical Chemistry. Recommendation 1973*, Butterworths: London, to be published. (Also in: *Pure and Appl. Chem.*, **37**, 517 (1974).)

Component names in Section 9 are given in small capitals, e.g. ACETOACETATE. This does not constitute a recommendation. It is often preferable to use ordinary type or (boldface) heavy type, but with an initial capital, e.g. Acetoacetate or **Acetoacetate**.

The letter l and numeral 1 should have distinctly different forms in typewritten and printed texts. Unfortunately, this is not possible in the fount used for the present document.

Note: The choice between spelling with -æ- or -œ- or -e- is not meant to imply a preference.

Ser. No.	System—Component(specifications), kind of quantity(specifications) =	Number × Unit		Ref.
A01	S—ACETOACETATE, substance concentration	22	µmol/l	
A02	(B)Erythrocytes—ACETYLCHOLINESTERASE, catalytic amount *per* HEMOGLOBIN(Fe), amount of substance	?	kat/mol	
A03	S—ACETYLCHOLINESTERASE, catalytic concentration(method)	?	kat/l	
A04	dU—ACID(H), amount of substance(Jørgensen 1957)	40	mmol	
A05	S—ACID PHOSPHATASE, catalytic concentration(method)	?	kat/l	
A06	S—ACID PHOSPHATASE(TARTRATE SENSITIVE), catalytic concentration(method)	?	kat/l	
A07	(dU)Adrenalinium + noradrenalinium —ADRENALINIUM, mole fraction	0,2	1	
A08	dU—ADRENALINIUM + NORADRENALINIUM, amount of substance	0,30	µmol	
A09	S—ALANINE AMINOTRANSFERASE, catalytic concentration(method)	?	kat/l	
A10	S—ALBUMIN, mass concentration	42	g/l	A14
A11	Sf—ALBUMIN, mass concentration	0,20	g/l	A15
A12	(S)Protein—ALBUMIN, mass fraction(method)	0,60	1	
A13	S—ALBUMIN. mass *per* GLOBULIN, mass	1,5	1	
A14	S—ALBUMIN(68 000), substance concentration	618	µmol/l	A10
A15	Sf—ALBUMIN(68 000), substance concentration	2,9	µmol/l	A11
A16	dPt—ALDOSTERONE(PRODUCED), amount of substance(method)	138	nmol	
A17	(fPt)S—ALIPHATIC CARBOXYLATE(C_{10}–C_{26}, NON-ESTERIFIED), substance concentration	0,58	mmol/l	
A18	dF—ALIPHATIC CARBOXYLATE(C_{10}–C_{26}, NON-ESTERIFIED + ESTERS), amount of substance	15	mmol	L11
A19	(fPt)S—ALIPHATIC CARBOXYLATE(C_{10}–C_{26}, NON-ESTERIFIED + ESTERS), substance concentration	11,1	mmol/l	
A20	S—ALKALINE PHOSPHATASE, catalytic concentration(method)	?	kat/l	
A21	(fPt)S—AMINO ACID-NITROGEN, substance concentration	3,0	mmol/l	N08
A22	dU—δ-AMINOLEVULINATE, amount of substance	43	µmol	Note 1
A23	S—δ-AMINOLEVULINATE, substance concentration	1,2	µmol/l	Note 1
A24	S—AMINOPEPTIDASE(CYTOSOL), catalytic concentration(method)	?	kat/l	Note 2
A25	dU—AMMONIUM, amount of substance	51	mmol	
A26	P—AMMONIUM ION, substance concentration	30	µmol/l	
A27	Rectal mucus—AMOEBA, arbitrary number concentration(method; 0-1)	0	arb. unit	
A28	U—α-AMYLASE, arbitrary catalytic concentration(method)	?	arb. unit	
A29	S—α-AMYLASE, catalytic concentration(method)	?	kat/l	
A30	S—ANION(A^-), substance concentration	155	mmol/l	
A31	S—ANTITHROMBIN III, arbitrary substance concentration(method)	?	arb. unit	
A32	S—α_1-ANTITRYPSIN, arbitrary substance concentration(method)	?	arb. unit	
A33	(fPt)S—ASCORBATE, substance concentration	55	µmol/l	
A34	S—ASPARTATE AMINOTRANSFERASE, catalytic concentration(method)	?	kat/l	

Note 1: The component is also called 4-Oxo-5-aminopropanoate.
Note 2: EC 3.4.11.1; the component was formerly called leucine aminopeptidase.

Ser. No.	System—Component(specifications), kind of quantity(specifications) =	Number × Unit		Ref.
B01	U—BACTERIA, arbitrary number concentration(method; 0-1)	0	arb. unit	
B02	U—BACTERIA(LIVING), number concentration(method)	10	10^6/l	
B03	S—BARBITURATES, arbitrary substance concentration(method)	0	arb. unit	Note 3
B04	aB—BASE(H^+-BINDING GROUPS), substance concentration(Singer and Hastings 1948)	45	mmol/l	
B05	aB—BASE(H^+-BINDING GROUPS), substance concentration difference(method; Pt − Norm)	0,0	mmol/l	
B06	Erythrocytes—BASOPHIL PUNCTATED ERYTHROCYTES, number fraction	0,20	10^{-3}	
B07	B—BASOPHILOCYTES, number concentration	0,12	10^9/l	
B08	(B)Leukocytes—BASOPHILOCYTES, number fraction	0,01	1	
B09	S—BILIRUBIN, substance concentration	4	µmol/l	
B10	(S)Bilirubins—BILIRUBIN ESTER, mole fraction(method)	0,5	1	
B11	S—BILIRUBIN ESTER, substance concentration	5	µmol/l	
B12	U—BILIRUBINS, arbitrary substance concentration(method; 0-1)	0	arb. unit	
B13	S—BILIRUBINS(NON-ESTERIFIED + ESTERS), substance concentration	9	µmol/l	
B14	F—BLOOD, arbitrary volume fraction(method; 0-4)	0	arb. unit	H06 Note 4
B15	Pt—BLOOD, volume	4,90	l	
B16	Pt—BLOOD, volume content(method)	70	ml/kg	
B17	Pt—BLOOD(ARTERIAL, DIASTOLIC), pressure(method)	10,4	kPa	
B18	Pt—BLOOD(ARTERIAL, SYSTOLIC), pressure(method)	15,6	kPa	
B19	B—BLOOD COAGULUM LYSIS, time(method)	?	s	
B20	S—BROMIDE, substance concentration	0,0	mmol/l	

Note 3: The numerical values equal those of 'S—Barbiturates, substance concentration', but measurement is performed as if the barbiturate(s) present were allylpropymal(NFN)—hence 'arbitrary'.

Note 4: The 'concentration' of blood is sought even if its hemoglobin is used as a marker in the method.

Ser. No.	System—Component(specifications), kind of quantity(specifications) =	Number × Unit		Ref.
C01	dF—CALCIUM(II) (Ca), amount of substance	16	mmol	
C02	dU—CALCIUM(II) (Ca), amount of substance	5,2	mmol	
C03	dU,U—CALCIUM(II) (Ca), substance concentration	4,3	mmol/l	
C04	S—CALCIUM(II) (Ca), substance concentration	2,5	mmol/l	C08

C05	S—CALCIUM(II) (Ca, CHELATE, < 1000), substance concentration	0,017	mmol/l	
C06	S—CALCIUM(II) ION (Ca, NON-CHELATE), substance concentration	1,3	mmol/l	
C07	S—CALCIUM(II) (Ca, PROTEIN BOUND), substance concentration	1,1	mmol/l	
C08	S—CALCIUM(II) (Ca, TOTAL), substance concentration	2,5	mmol/l	C04
C09	Pt—CAPILLARY BLEEDING, time(method)	0,15	ks	
C10	dU—CARBAMIDE, amount of substance	0,48	mol	
C11	dU—CARBAMIDE, substance concentration	0,40	mol/l	
C12	S—CARBAMIDE, substance concentration	4,1	mmol/l	
C13	Gas(aB equilibrated)—CARBON DIOXIDE, partial pressure(method; 37,0 °C)	5,4	kPa	C14
C14	(aB)P—CARBON DIOXIDE, substance concentration	1,2	mmol/l	C13
C15	Expiratory gas—CARBON DIOXIDE, volume fraction	0,05	1	
C16	(B)Hemoglobin—CARBON MONOXIDE HEMOGLOBIN, mole fraction	0,01	1	
C17	B—CARBON MONOXIDE HEMOGLOBIN(Fe), substance concentration	0,08	mmol/l	
C18	P—CARBONATE + CARBON DIOXIDE, substance concentration	27,5	mmol/l	
C19	U—CASTS, arbitrary number concentration(method; 0-1)	0	arb. unit	
C20	U—CASTS, number(Addis 1949; 12 h, night)	5	10^3	
C21	F—CATALASE, arbitrary catalytic concentration(method; 0-1)	0	arb. unit	
C22	S—CATION(B^+), substance concentration	155	mmol/l	
C23	Sf—CELLS, number concentration	2	10^6/l	
C24	S—CERULOPLASMIN(150 000), substance concentration	1,6	µmol/l	
C25	dU—CHLORIDE, amount of substance	165	mmol	
C26	dU,U—CHLORIDE, substance concentration	138	mmol/l	
C27	S—CHLORIDE, substance concentration	103	mmol/l	
C28	S—CHOLESTEROL, substance concentration	1,7	mmol/l	
C29	S—CHOLESTEROL(NON-ESTERIFIED), substance concentration	1,7	mmol/l	Note 5
C30	S—CHOLESTEROLS, substance concentration	6,2	mmol/l	
C31	S—CHOLESTERYL ESTERS, substance concentration	4,5	mmol/l	
C32	nU—CHORIONGONADOTROPIN, arbitrary substance concentration(method; 0-1)	—	arb. unit	
C33	S—CITRATE, substance concentration	115	µmol/l	
C34	B—COAGULATION, time(method)	?	ks	
C35	P—COAGULATION FACTORS(I + II + V + VII + X), arbitrary time(Quick 1935)	21	arb. unit	
C36	P—COAGULATION FACTORS(II + VII + X), relative arbitrary substance concentration (method; Pt/Norm)	1,00	1	
C37	S—COBALAMIN(Co), substance concentration(method)	350	pmol/l	
C38	S—COPPER(II), substance concentration	18	µmol/l	
C39	dU—COPROPORPHYRINS(I + III), amount of substance	0,23	µmol	
C40	P—CORTICOSTERONE, substance concentration	17	nmol/l	

Note 5: This type of quantity equals C28, but the former may be used together with C31 for emphasis.

Ser. No.	System—Component(specifications), kind of quantity(specifications)	Number × Unit		Ref.
C41	P—CORTISOL, substance concentration	400	nmol/l	
C42	P—CORTISONE, substance concentration	32	nmol/l	
C43	dU—CREATINE, amount of substance	80	µmol	
C44	dU,U—CREATINE, substance concentration	67	µmol/l	
C45	S—CREATINE, substance concentration	40	µmol/l	
C46	S—CREATINE KINASE, catalytic concentration(method)	?	kat/l	
C47	dU—CREATININIUM, amount of substance	19,5	mmol	
C48	dU,U—CREATININIUM, substance concentration	16,3	mmol/l	
C49	S—CREATININIUM, substance concentration	0,07	mmol/l	
C50	S—CRYOGLOBULIN, arbitrary substance concentration(method; 0-1)	0	arb. unit	
D01	P—11-DEOXYCORTISOL, substance concentration	8	nmol/l	
D02	dU—2,5-DIHYDROXYPHENYLACETATE, amount of substance	0,0	mmol	
D03	Gas(aB equilibrated)—DIOXYGEN, partial pressure(method; 37,0 °C)	13,0	kPa	D04
D04	(aB)P—DIOXYGEN, substance concentration	0,13	mmol/l	D03
D05	fPt—DIOXYGEN(ABSORBED), relative substance rate (resting; Pt/Norm)	1,00	1	
E01	B—EOSINOPHILOCYTES, number concentration	0,22	10^9/l	
E02	(B)Leukocytes—EOSINOPHILOCYTES, number fraction	0,02	1	
E03	U—EPITHELIAL CELLS, arbitrary number concentration(method; 0-3)	1	arb. unit	
E04	(B)Erythrocyte(mean) —ERYTHROCYTE, diameter	7,5	µm	
E05	(B)Erythrocyte(mean) —ERYTHROCYTE, volume	88	fl	
E06	(B)Erythrocyte(mean) —ERYTHROCYTE LIFE, time	115	d	
E07	U—ERYTHROCYTES, arbitrary number concentration(method; 0-3)	1	arb. unit	
E08	nU—ERYTHROCYTES, number(Addis 1949; 12 h, night)	0,7	10^6	
E09	B—ERYTHROCYTES, number concentration	5,00	10^{12}/l	
E10	Sf—ERYTHROCYTES, number concentration	0	10^6/l	
E11	B—ERYTHROCYTES, volume fraction	0,47	1	
E12	dU—ESTRADIOL, amount of substance(female Pt, ovulation peak)	0,035	µmol	
E13	dU—ESTRIOL, amount of substance(female Pt, ovulation peak)	0,082	µmol	
E14	dU—ESTROGEN, amount of substance(postmenopausal Pt)	0,030	µmol	
E15	dU—ESTRONE, amount of substance(male Pt)	0,019	µmol	
E16	B—ETHANOL, substance concentration	0,0	mmol/l	

F01	P—FIBRINOGEN(340 000), substance concentration	8,8	µmol/l	
F02	P—FIBRINOLYSIS, time(method)	?	s	
F03	Glomeruli—FLUID(FILTRATED), mean volume rate(creatininium; 1d)	1,6	ml/s	
F04	Tap water—FLUORIDE, substance concentration	40	µmol/l	
F05	(B)Hemoglobin—FOETAL HEMOGLOBIN, mole fraction	0,00	1	
F06	(fPt)S—FOLATES, substance concentration(method)	26	nmol/l	
F07	U—FORMIMINOGLUTAMATE, amount of substance (after L-histidine, amount of substance = 97 mmol; 32,4 ks)	100	µmol/l	
F08	S—FREEZING-POINT DEPRESSION, temperature difference	545	mK	
F09	S—FRUCTOSE-BIPHOSPHATE ALDOLASE, catalytic concentration(method)	?	kat/l	
G01	(B)Erythrocyte(mean) —GALACTOSE-1-PHOSPHATE URIDYLTRANSFERASE, catalytic amount(method)	?	kat	
G02	S—α_1-GLOBULIN, arbitrary mass concentration	2,0	arb. unit	Note 6
G03	S—α_2-GLOBULIN, arbitrary mass concentration	5,0	arb. unit	Note 6
G04	S—β_1-GLOBULIN, arbitrary mass concentration	3,0	arb. unit	Note 6
G05	S—β_2-GLOBULIN, arbitrary mass concentration	3,0	arb. unit	Note 6
G06	S—γ-GLOBULIN, arbitrary mass concentration	8,5	arb. unit	I02 Note 6
G07	Sf—GLOBULIN, arbitrary substance concentration(method; 0-1)	0	arb. unit	
G08	S—GLOBULIN, mass concentration	22	g/l	
G09	dU—GLUCOSE, amount of substance	2,3	mmol	
G10	U—GLUCOSE, arbitrary substance concentration(Clinistix® ; 0-1)	0	arb. unit	
G11	(fPt)P—GLUCOSE, substance concentration	5,6	mmol/l	
G12	Sf—GLUCOSE, substance concentration	2,8	mmol/l	
G13	U—GLUCOSE, substance concentration	1,9	mmol/l	
G14	(B)Erythrocyte(mean)—GLUCOSE-6-PHOSPHATE DEHYDROGENASE, catalytic amount(method)	?	kat	

Note 6: The mass concentration is not well known.

Ser. No.	System—Component(specifications), kind of quantity(specifications) =	Number × Unit		Ref.
H01	S—α_2-HAPTOGLOBIN, arbitrary substance concentration(method; 0-3)	2	arb. unit	
H02	S—HAPTOGLOBIN, substance concentration(hemoglobin binding)	7,5	µmol/l	
H03	Pt—height	1,70	m	Note 7

Note 7: An alternative is 'Pt—PATIENT, height' or 'Pt—BODY, height'.

Ser. No.	System—Component(specifications), kind of quantity(specifications) =	Number × Unit		Ref.
H04	F— *Helminthes* EGGS, arbitrary number concentration(method; 0-3)	0	arb. unit	
H05	(B)Hemoglobin— HEMIGLOBIN, mole fraction	0,01	1	
H06	F— HEMOGLOBIN, arbitrary substance concentration(method; 0-1)	0	arb. unit	B14
H07	U—HEMOGLOBIN, arbitrary substance concentration(method; 0-1)	0	arb. unit	
H08	(B)Erythrocyte(mean)—HEMOGLOBIN(Fe), amount of substance	2,0	fmol	
H09	(B)Erythrocyte(mean)—HEMOGLOBIN(Fe), substance concentration	21	mmol/l	
H10	P—HEMOGLOBIN(Fe), substance concentration	10	µmol/l	
H11	B—HEMOGLOBIN(Fe), substance concentration(ICSH 1966)	9,6	mmol/l	
H12	S—β_2-HEMOPEXIN, arbitrary substance concentration(method; 0-3)	2	arb. unit	
H13	U—HOMOGENTISATE, arbitrary substance concentration(method; 0-1)	0	arb. unit	
H14	P—HYDROGEN CARBONATE ION, substance concentration (blood; $c(O_2) = 0{,}21$ mmol/l; $c(CO_2) = 1{,}19$ mmol/l; $\theta = 37$ °C)	23,6	mmol/l	
H15	(aB)P—HYDROGEN ION, substance concentration	39,6	nmol/l	P06
H16	P—3-HYDROXYBUTYRATE, substance concentration	10	µmol/l	
H17	S—2-HYDROXYBUTYRATE DEHYDROGENASE, catalytic concentration(method)	?	kat/l	
H18	dU—17-HYDROXYCORTICOSTEROID, amount of substance(method)	0,42	mmol	
H19	P—11-HYDROXYCORTICOSTEROID, substance concentration	0,42	µmol/l	
H20	dU—5-HYDROXYINDOLYL ACETATE, amount of substance	30	µmol	
H21	dU—4-HYDROXY-3-METHOXYMANDELATE, amount of substance	25	µmol	
H22	dU—HYDROXYPROLINE, amount of substance	0,16	mmol	
I01	S—IMMUNOGLOBULIN A, arbitrary substance concentration(method)	105	10^3 int. unit/l	
I02	S—IMMUNOGLOBULIN G, arbitrary substance concentration(method)	120	10^3 int. unit/l	G06
I03	S—IMMUNOGLOBULIN M, arbitrary substance concentration(method)	97	10^3 int. unit/l	
I04	S—INSULIN, arbitrary substance concentration(method)	25	10^{-3} int. unit/l	I05
I05	S—INSULIN(5800), substance concentration(method)	183	pmol/l	
I06	S—IODINE(I, PROTEIN BOUND), substance concentration	0,41	µmol/l	
I07	S—ION(A^- + B^+), substance concentration	310	mmol/l	
I08	dU—IRON(II + III), amount of substance	2,3	µmol	
I09	dU,U—IRON(II + III), substance concentration	1,9	µmol/l	

I10	(fPt)S—IRON(II + III) (IN HEMOGLOBIN AND TRANSFERRIN), substance concentration	33	µmol/l	
I11	(fPt)S—IRON(III) (TRANSFERRIN BOUND), substance concentration	23,6	µmol/l	
L01	S—LACTATE, substance concentration	0,50	mmol/l	
L02	S—LACTATE DEHYDROGENASE, catalytic concentration(method)	?	kat/l	
L03	dU—LEAD(II), amount of substance	0,07	µmol	
L04	B—LEAD(II), substance concentration	1,2	µmol/l	
L05	dU,U—LEAD(II), substance concentration	0,06	µmol/l	
L06	U—LEUKOCYTES, arbitrary number concentration(method; 0-3)	1	arb. unit	
L07	B—LEUKOCYTES, number concentration	6,5	10^9/l	
L08	Sf—LEUKOCYTES, number concentration	1	10^6/l	
L09	U—LEUKOCYTES + EPITHELIAL CELLS, number(Addis 1949; 12 h, night)	2,0	10^6	
L10	F—LIPID, arbitrary volume fraction(method; 0-1)	0	arb. unit	
L11	dF—LIPID, mass(method)	4,0	g	A18
L12	(fPt)S—LIPID, mass concentration(method)	6,7	g/l	
L13	S—α_1-LIPOPROTEIN, arbitrary substance concentration(method; 0-3)	2	arb. unit	
L14	S—α_2-LIPOPROTEIN, arbitrary substance concentration(method; 0-3)	2	arb. unit	
L15	S—β-LIPOPROTEIN, arbitrary substance concentration(method; 0-3)	2	arb. unit	
L16	B—LYMPHOCYTES, number concentration	2,0	10^9/l	
L17	(B)Leukocytes—LYMPHOCYTES, number fraction	0,30	1	
M01	S—α_2-MACROGLOBULIN, arbitrary substance concentration(method; 0-3)	2	arb. unit	
M02	dF—MAGNESIUM(II) (Mg), amount of substance	7,2	mmol	
M03	dU—MAGNESIUM(II) (Mg),amount of substance	2,6	mmol	
M04	dU,U—MAGNESIUM(II) (Mg), substance concentration	2,2	mmol/l	
M05	S—MAGNESIUM(II) (Mg), substance conc	1,0	mmol/l	M08
M06	S—MAGNESIUM(II) (Mg, CHELATE, < 1000), substance concentration	0,13	mmol/l	
M07	S—MAGNESIUM(II) (Mg, PROTEIN BOUND), substance concentration	0,30	mmol/l	
M08	S—MAGNESIUM(II) (Mg, TOTAL), substance concentration	1,0	mmol/l	M05
M09	S—MAGNESIUM(II) ION (Mg, NON-CHELATE), substance concentration	0,57	mmol/l	
M10	Pt—mass	70,0	kg	Note 8
M11	U—MELANIN + MELANOGEN, arbitrary substance concentration(method; 0-1)	0	arb. unit	

Note 8: An alternative is 'Pt—PATIENT, mass' or 'Pt—BODY, mass'.

Ser. No.	System—Component(specifications), kind of quantity(specifications)	Number × Unit		Ref.
M12	U—METHYLKETONES, arbitrary substance concentration(Acetest® ; 0-1)	0	arb. unit	
M13	B—MONOCYTES, number concentration	0,50	10^9/l	
M14	(B)Leukocytes—MONOCYTES, number fraction	0,05	1	
M15	S—MUCOPROTEIN, mass concentration(method)	0,75	g/l	
M16	Expectorate—*Mycobacterium* SP., arbitrary number concentration(method; 0-1)	0	arb. unit	
N01	Urethral secretion—*Neisseria* SP., arbitrary number concentration(method; 0-1)	0	arb. unit	
N02	B—NEUTROPHILOCYTES(NON-SEGMENTED), number concentration	0,20	10^9/l	
N03	(B)Leukocytes—NEUTROPHILOCYTES(NON-SEGMENTED), number fraction	0,02	1	
N04	B—NEUTROPHILOCYTES(SEGMENTED), number concentration	6,5	10^9/l	
N05	(B)Leukocytes—NEUTROPHILOCYTES(SEGMENTED), number fraction	0,65	1	
N06	dF—NITROGEN, amount of substance	70	mmol	
N07	dU—NITROGEN, amount of substance	1,10	mol	
N08	(fPt)S—NITROGEN(AMINO ACID), substance concentration	3,0	mmol/l	A21
N09	S—NITROGEN(NON-PROTEIN), substance concentration	19	mmol/l	
O01	S—ORNITHINE CARBAMOYLTRANSFERASE, catalytic concentration(method)	?	kat/l	
O02	S—α_1-OROSOMUCOID, arbitrary substance concentration(method; 0-3)	2	arb. unit	
O03	(B)Erythrocytes—OSMOTIC PRESSURE REACTION, arbitrary pressure(method)	140	arb. unit	
O04	dU—OXALATE, amount of substance	0,30	mmol	
O05	dU—17-OXOSTEROID, amount of substance(method)	44	µmol	
O06	(aB)Hemoglobin—OXYHEMOGLOBIN, mole fraction(method)	0,95	1	
P01	U—PHENYLPYRUVATE, arbitrary substance concentration(method; 0-1)	0	arb. unit	
P02	dU—PHOSPHATE(P), amount of substance	35	mmol	
P03	dU,U—PHOSPHATE(P), substance concentration	29	mmol/l	
P04	S—PHOSPHATE(P, NON-ESTERIFIED), substance concentration	1,3	mmol/l	
P05	S—PHOSPHOLIPID(P), substance concentration	2,75	mmol/l	
P06	aB—PLASMA, pH(37,0 °C)	7,41	1	H15
P07	Pt—PLASMA, volume	2,50	l	
P08	B—PLATTULOCYTES, number concentration	225	10^9/l	
P09	U—PORPHOBILINOGEN, arbitrary substance concentration(method; 0-1)	0	arb. unit	
P10	U—PORPHYRINS, arbitrary substance concentration(method)	?	arb. unit	
P11	dU—POTASSIUM ION, amount of substance	69	mmol	
P12	dU,U—POTASSIUM ION, substance concentration	58	mmol/l	
P13	Erythrocytes—POTASSIUM ION, substance concentration	90	mmol/l	

P14	P,S—POTASSIUM ION, substance concentration	4,3	mmol/l	
P15	dU—PREGNANDIOL, amount of substance	10	µmol	
P16	dU—PREGNANTRIOL, amount of substance	12	µmol	
P17	U—PROTEIN, arbitrary substance concentration(Albustix® ; 0-1)	0	arb. unit	
P18	U—PROTEIN, arbitrary substance concentration(Bence Jones 1948; 0-1)	0	arb. unit	
P19	dU—PROTEIN, mass(method)	60	mg	
P20	S—PROTEIN, mass concentration(method)	71	g/l	
P21	Sf—PROTEIN, mass concentration(method)	0,30	g/l	
P22	U—PROTEIN, mass concentration(method)	0,05	g/l	
P23	Pt—PULSE, frequency(30 s)	1,20	Hz	
R01	Pt—RECTUM, Celsius temperature	36,9	°C	
R02	Pt—RECTUM, thermodynamic temperature	310,1	K	
R03	Pt—RESPIRATION, frequency(60 s)	0,20	Hz	
R04	B—RETICULOCYTES, number concentration	30	10^9/l	
R05	(B)Erythrocytes—RETICULOCYTES, number fraction	6	10^{-3}	
S01	U—SACCHARIDE, arbitrary substance concentration(Fehling; 0-1)	0	arb. unit	
S02	B—SEDIMENTATION REACTION, arbitrary length(method)	5	arb. unit	
S03	dU—SODIUM ION, amount of substance	200	mmol	
S04	dU,U—SODIUM ION, substance concentration	167	mmol/l	
S05	P,S—SODIUM ION, substance concentration	141	mmol/l	
S06	P—SOMATOTROPINE, substance concentration	0,11	nmol/l	
S07	(B)Hemoglobin—SULPHHEMOGLOBIN, mole fraction	0,01	1	
S08	Pt—SULPHOBROMPHTHALEINATE, relative amount of substance (Pt 2,7 ks/Pt 0 ks; method)	0,03	1	
T01	dU—TESTOSTERONE, amount of substance(male Pt)	0,25	µmol	
T02	S—TESTOSTERONE, substance concentration(male Pt)	22	nmol/l	
T03	(fPt)S—THYMOL REACTION, arbitrary substance concentration(Maclagan 1944; 0, 1, 2 . . .)	0	arb. unit	
T04	S—THYROXIN, substance concentration(method)	102	nmol/l	
T05	S—β_1-TRANSFERRIN, arbitrary substance concentration(method; 0-3)	2	arb. unit	
T06	(fPt)S—TRANSFERRIN(74000), substance concentration	30,8	µmol/l	
T07	(fPt)S—TRIACYLGLYCEROL LIPASE(ATOXYL® RESISTANT), catalytic concentration(method)	?	kat/l	Note 9
T08	(fPt)S—TRIACYLGLYCEROL LIPASE(QUININIUM RESISTANT), catalytic concentration(method)	?	kat/l	Note 9
T09	S—TRIGLYCERIDE, substance concentration(method)	0,75	mmol/l	
T10	(fPt)S—TRIIODOTHYRONINE REACTION, arbitrary substance concentration(method)	?	arb. unit	
T11	F—TRYPSIN, arbitrary catalytic concentration(method; 0-1)	0	arb. unit	

Note 9: EC 3.1.1.3; the component (without specification) was formerly called lipase.

Ser. No.	System—Component(specifications), kind of quantity(specifications)	Number ×	Unit	Ref.
U01	dU—URATE, amount of substance	2,90	mmol	
U02	(U)Concrement—URATE, arbitrary substance content(murexide; 0-1)	1	arb. unit	
U03	dU,U—URATE, substance concentration(method)	2,42	mmol/l	
U04	S—URATE, substance concentration(method)	0,28	mmol/l	
U05	Pt—URINE, mass density(20,0 °C)	1,019	kg/l	
U06	Pt—URINE, pH(indicator paper)	6,3	1	
U07	Pt—URINE, relative density(U 20,0 °C/Water 20,0 °C)	1,020	1	
U08	dPt—URINE, volume	1,20	l	
U09	U—UROBILIN, arbitrary substance concentration(method)	10	arb. unit	
U10	(fPt)U—UROBILINOGEN, arbitrary substance concentration(method; 0-1)	0	arb. unit	
U11	dU—UROPORPHYRINS (I + III), amount of substance	10	nmol	

10. INDEX