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COMMISSION ON AUTOMATION AND CLINICAL CHEMICAL TECHNIQUES†
in collaboration with
INTERNATIONAL FEDERATION OF CLINICAL CHEMISTRY
SUBCOMMITTEE ON ANALYTICAL SYSTEMS

NOMENCLATURE FOR AUTOMATED AND MECHANISED ANALYSIS

(Recommendations 1989)

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Nomenclature for automated and mechanised analysis (Recommendations 1989)

INTRODUCTION

In 1970 the Commission on Analytical Nomenclature of the Analytical Chemistry Division produced the document "Recommended Nomenclature for Automatic Analysis" (Pure and Applied Chemistry 1970;21:527-531).

In 1978 the Commission on Automation and Clinical Chemical Techniques of the Clinical Chemistry Division, produced the document "Characteristics and Attributes of Instruments intended for Automated Analysis in Clinical Chemistry" (IUPAC Information Bulletin 1978;3:233-240). This document contained a glossary.

Subsequently it was decided by the two Commissions jointly to produce a document to supersede the two previous documents. The aim has been to provide a single document containing terms currently used for automated and mechanised analysis in analytical and clinical chemistry with definitions relevant to their particular use in those areas. Most definitions were taken from the above documents or other appropriate sources, others were elaborated by the two Commissions. Where relevant, nomenclature from the International Vocabulatory of Basic and General Terms in Metrology 1984 (VIM) has been considered and used with the appropriate reference number.

The Subcommittee on Analytical Systems of the International Federation of Clinical Chemistry is especially acknowledged for its critical review of draft versions of the present document.

Terms are classified under five sections: 1 - General; 2 - Material analysed; 3 - Sample processing; 4 - Measurement; 5 - Performance.

They are listed in alphabetical order within each section; a cumulative index is given hereunder.

CUMULATIVE ALPHABETICAL INDEX

TERM	DEFINITION	NOTES
	SECTION 1 - GENERAL	
ANALYTICAL INSTRUMENT (substantive)	A device or a combination of devices used to carry out an analytical process.	The analytical process is all or part of the analytical procedure that encompasses all steps from the introduction of the sample or the test portion to the production of result. An analytical instrument may carry out single or multiple analytical procedures. In the latter case it may be selective, that is, designed to carry out any requested combination of procedures within the set, on each specimen.
AUTOMATION (substantive)	Mechanisation with process control.	In this context process means a sequence of manipulations. One or several functions in an analytical instrument may be automated. The corresponding adjective is automated and the verb is automate. See also MECHANISATION as distinct from automation.
FEEDBACK (substantive)	The process whereby the output of a device is used to modify the operation of an analytical instrument.	
MACHINE (substantive)		The use of this term is not recommended. See ANALYTICAL INSTRUMENT.
MANUAL (adjective)	Refers to physical human intervention in an analytical procedure.	
MECHANISATION (substantive)	The use of devices to replace, refine, extend or supplement human effort.	The corresponding verb is mechanise.
PROGRAM (substantive)	A set of instructions enabling a device to perform an action.	
PROGRAM (verb)	To provide a set of instructions enabling a device to perform an action.	
REPORT (substantive)	A combination of specimen information and results.	The report should contain information about unequivocal identification of the source and type of material analysed and the requesting agency. It may contain such other information that is pertinent to the correct interpretation of a result (e.g. confidence interval, reference data and interpretative information).

TERM	DEFINITION	NOTES
	SECTION 2 - MATERIAL ANALYSED	
ANALYTE (substantive)	The component of a system to be analysed.	
CALIBRATION MATERIAL (substantive)	A material of known composition or properties which can be presented to the analytical instrument for calibration purposes.	The VIM definition of reference materials 6:15 is less suitable in clinical chemistry. See CONTROL MATERIAL.
CALIBRATION SAMPLE (substantive)	The test portion or test solution used for calibration of an analytical procedure.	The calibration sample is normally of known weight or volume and is prepared according to specifications. See also TEST PORTION, TEST SOLUTION and MEASUREMENT SOLUTION.
CONTROL MATERIAL (substantive)	A material to be used for the assessment of the performance of an analytical procedure or part thereof.	The VIM definition is less suitable in clinical chemistry. See CALIBRATION MATERIAL.
CONTROL SAMPLE (substantive)	The test portion or test solution used for assessment of the performance of an analytical procedure.	See CALIBRATION SAMPLE.
MATRIX (substantive)	The components of the sample other than the analyte.	
MATRIX EFFECT (substantive)	The combined effect of all components of the sample other than the analyte on the measurement of the quantity.	If a specific component can identified as causing an effect then this is referred to as interference. See MATRIX.
MEASUREMENT SOLUTION (substantive)	The solution that is presented to the measuring device.	The measurement solution comprises the test solution, or an aliquot thereof, after it has undergone any treatment required prior to the presentation to the measuring device.
SAMPLE (substantive)	The material available for investigation.	This is a qualitative term only. The term needs to be qualified, e.g. bulk sample, representative sample, primary sample, bulked sample, test sample.
TEST PORTION (substantive)	The amount or volume of the test sample taken for analysis.	The test portion is usually of known weight or volume.
TEST SOLUTION (substantive)	The solution prepared from the test portion for the analytical procedure.	The proportions of test portion and solvent are normally known.

TERM	DEFINITION	NOTES
	SECTION 3 - SPECIMEN PROCESSING	
BATCH OPERATION (substantive)	The operation of an analytical instrument in such a way that one or more analytical procedures must be completed for a sequence of samples before the next sequence can be started.	This term batch usually implies a sequence of a variably sized group of samples, the size of which is not related to a particular type of instrument.
CENTRIFUGAL FLOW (substantive)		See TRANSPORT.
CHANNEL (substantive)	That part of an analytical instrument that is dedicated to a single analytical procedure, including the transducer.	This term relates to the internal operation of certain types of instruments, particularly in Clinical Chemistry. The general term channel has a much broader meaning. This term is not recommended.
CONTINUOUS FLOW (substantive)		See TRANSPORT.
CONTINUOUS OPERATION (substantive)	The operation of an analytical instrument in such a way that no analytical procedure needs to be completed on any sample before the next procedure can be started.	
DILUTER (substantive)	A device used to add a measured volume or amount of the sample to a measured volume of a diluent.	
DISCRETE TRANSPORT (substantive)		See TRANSPORT.
DISPENSER (substantive)	A device used to deliver a measured amount of material.	See SAMPLER.
FLOW INJECTION (substantive)	The introduction of a sample or reagent into a continuous stream by use of a rapid delivery device.	
PRESSURE FLOW (substantive)		See TRANSPORT.
SAMPLE HANDLING (substantive)	Any action applied to the sample before the analytical procedure.	Such actions include the addition of preservatives, separation procedures, storage at low temperature, protection against light and irradiation, loading, etc.
SAMPLER (substantive)	A device used to withdraw and deliver a volume or an amount of the sample.	
SEGMENT (substantive)	The set of samples which can be analysed between two successive calibrations.	A segment includes samples, calibration materials, control materials and blank samples. This term is of particular importance in clinical chemistry.

TERM	DEFINITION	NOTES
TRANSFER (substantive)	The action of moving materials between containers, or containers between transport devices.	This term is of particular importance in clinical chemistry.
TRANSPORT (substantive)	The action of moving materials within the analytical instrument.	Transport can involve any of several means including pressure flow, where the materials are moved by fluid pressure, either continuously or discontinuously; centrifugal flow, where the materials are moved by centrifugal force; spontaneous motion, where the materials are moved due to their intrinsic properties, e.g. diffusion, capillarity; and discrete transport, where materials are enclosed within a moving container.
	SECTION 4 - MEASUREMENTS	
BLANK VALUE (substantive)	Reading or result originating from the matrix, reagents and any residual bias in the measurement device or process, which contributes to the value obtained for the quantity in the analytical procedure.	This term is more correct than colloquial BLANK and BACKGROUND. By appropriate design of experiment it is usually possible to distinguish between the blank value due to reagent(s), instruments, calibration and the matrix of the sample.
CALIBRATION (substantive)	The set of operations which establish, under specified conditions, the relationship between values indicated by the analytical instrument and the corresponding known values of an analyte.	This definition relates to that of VIM 6:13 with the omission of "measuring instrument" and "values represented by a material measure" and the use of "analytical instrument" instead of "measuring device" and "analyte" instead of "measurand". See CALIBRATION MATERIAL.
READING (substantive)	Datum provided by an instrument.	This definition relates to that of VIM 3:02 with the use of "analytical instrument" instead of "measurand".
RESULT (substantive)	The value of a quantity obtained by measurement.	The result includes all computation and a statement of the quantity and the appropriate unit. The definition corresponds to that of VIM 301 with the use of "quantity" instead of "measurand".
SIGNAL (substantive)	A representation of a quantity within an analytical instrument.	This definition corresponds to that of VIM 2:12 with the use of "quantity" instead of "measurand" and "analytical instrument" instead of "measuring system".
TRANSDUCER (substantive)	An analytical instrument which provides an output quantity having a given relationship to the input quantity.	This definition corresponds to that of VIM 4:03 with the use of "analytical instrument" instead of "measuring device".

TERM	DEFINITION	NOTES
	SECTION 5 - PERFORMANCE (See Fig. 1)	
ACCURACY (substantive)	Agreement between the mean estimate of a quantity and its true or accepted value.	This definition is adopted by IFCC and relates to that of VIM 3:05 with the deletion of "the closeness of". Accuracy is a quantitative term in analytical chemistry and clinical chemistry and is numerically expressed by INACCURACY (see this term). Quantities represent mean estimates because of frequent sample inhomogeneity.
CARRY-OVER (substantive)	A process by which materials are carried into a reaction mixture where they do not belong.	
DETECTION LIMIT (substantive)	The minimum single result which, with a stated probability, can be distinguished from a suitable blank value.	The limit defines the point at which the analysis becomes possible and this may be different from the lower limit of the determinable analytical range.
DOWN-TIME (substantive)	The loss of time that should be available for analysis.	This might be due to breakdown, maintenance or other factors.
DRIFT (substantive)	A slow non-random change in signal with time.	
IMPRECISION (substantive)	Variation of the result in a set of replicate measurements.	This can be expressed, e.g. as the standard deviation or co-efficient of variation (*relative standard deviation*). This term may have a more general meaning, e.g. if the replicates constitute a batch or involve different instruments, laboratories and analyst. See PRECISION.
INACCURACY (substantive)	Numerical difference between the mean of a set of replicate measurements and the true value.	This difference, positive or negative, is expressed in the units in which the quantity is measured or as a fraction of the true value. (The percentage is synonymous with the term percentage relative error as commonly used). This definition is adopted by IFCC. See IMPRECISION.
INPUT RATE (substantive)	The number of samples that are processed by the instrument divided by time of operation.	It should be stated if the residence time is included or not. See RESIDENCE TIME.
INSTRUMENTAL DEPENDABILITY (substantive)	Relates to the frequency of failures which interrupt the operation of the instrument.	It can be quantified, e.g. by the infrequency of breakdowns or by the availability of the instrument for use when required.
NOISE (substantive)	The random fluctuations occurring in a signal that are inherent in the combination of instrument and method.	

TERM	DEFINITION	NOTES
OUTPUT RATE (substantive)	The number of results that is produced by the instrument divided by time of operation.	
PRECISION (substantive)	Agreement between replicate measurements.	This is a qualitative term only and has no numerical value. See IMPRECISION.
RESIDENCE TIME (substantive)	The minimum time interval between the introduction of a specimen and the production of the corresponding result(s).	
SENSITIVITY	The ability of an analytical procedure to produce a change in the signal for a defined change of the quantity.	This is usually measured by the slope of the calibration curve.
SHUT-DOWN STATE (substantive)	The condition of an instrument when it is switched off to conserve energy or reagents or to protect working parts.	This term is of particular importance in clinical chemistry.
SHUT-DOWN TIME (substantive)	The time interval between production of the last result of the instrument and shut-down state.	See SHUT-DOWN STATE.
STAND-BY STATE (substantive)	The condition of an instrument where the analytical procedure can begin immediately.	See SHUT-DOWN STATE and START-UP TIME.
START-UP TIME (substantive)	The time interval between turn-on of the instrument and its stand-by state.	See SHUT-DOWN STATE and STAND-BY STATE.
THROUGHPUT RATE (substantive)		Not recommended. See INPUT RATE and OUTPUT RATE.

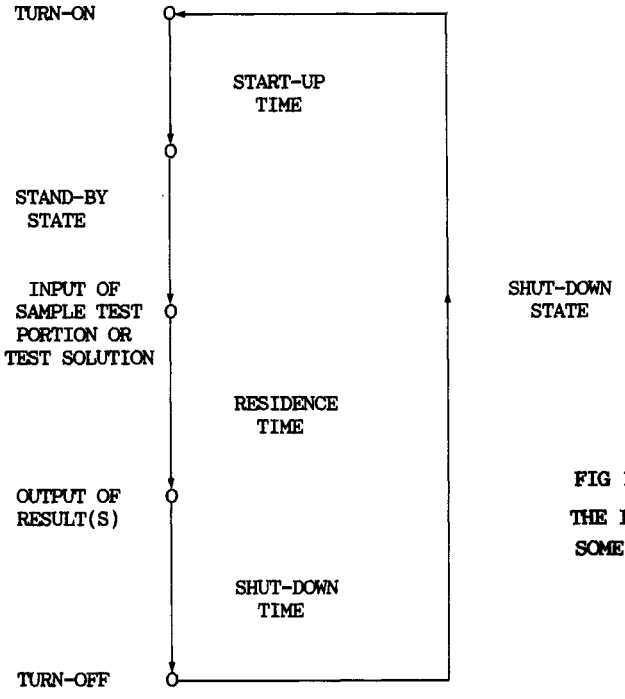

FIG 1

THE INTER-RELATIONSHIPS BETWEEN SOME OF THE TERMS IN SECTION 5.