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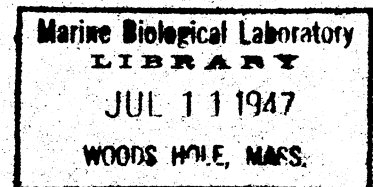
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[p.t.o.]

the presentation of the results and the discussion of their significance should be considered separately; (e) Summary: a brief self-contained summary, amounting to not more than 3% of the length of the paper, should be included; the paragraphs of the summary should be numbered; (f) References: these should be given in the text thus: Barnett & Robinson (1942), (Culbertson & Thomas, 1933); where a paper to be cited has more than two authors, the names of all the authors should be given when reference is first made, e.g. (Osborne, Mendel & Ferry, 1919); subsequent citations should appear thus: (Osborne *et al.* 1919). Where more than one paper by the same authors has appeared in one year the reference should be given as follows: Osborne & Mendel (1914*a*); Osborne & Mendel (1914*b*); or Osborne & Mendel (1914*a, b*); (Osborne & Mendel, 1914*a*, 1916; Barnett & Robinson, 1942).

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Doisy, E. A., Somogyi, M. & Shaffer, P. A. (1923). *J. biol. Chem.* 55, Proc. xxxi.  
Fairley, N. H. (1938). *Nature, Lond.*, 142, 1156.  
Hennessy, D. J. (1941). *Industr. Engng Chem.* (Anal. ed.), 13, 216.  
King, H. (1941). *J. chem. Soc.* p. 338.  
Osborne, T. B. & Mendel, L. B. (1914*a*). *J. biol. Chem.* 17, 325.  
Osborne, T. B. & Mendel, L. B. (1914*b*). *J. biol. Chem.* 18, 1.  
Osborne, T. B. & Mendel, L. B. (1916). *Biochem. J.* 10, 534.  
Osborne, T. B., Mendel, L. B. & Ferry, E. L. (1919). *J. biol. Chem.* 37, 233.  
Starling, E. H. (1915). *Principles of Human Physiology*, 2nd ed. London: Churchill.

**Statistical Treatment of Data.** In general the publication is not necessary of all the individual results of a number of similar experiments. A statement of the number of individual results, their mean value, the standard error of the mean value, and the extreme range (highest and lowest values in the series) is usually sufficient.

A statement that a significant difference probably exists between the mean values of two groups of data should be accompanied by the calculated probability that the observed difference is significant.

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name. Diagrams should be in Indian ink and should be drawn on plain white paper, Bristol board, or faintly blue-lined paper. Curves based on experimental data should carry clear indications of the experimentally determined points. Letters, numbers, etc., should be written lightly in pencil. On the back of each figure should be written the author's name and the title of the paper. Legends and captions should be typed separately from the illustrations, each on a separate sheet, and numbered correspondingly with the relevant illustration. Figures should be comprehensible without reference to the text.

**Tables.** Tables should carry headings describing their content and should be comprehensible without reference to the text. The dimensions of the data, e.g. g./100 ml., should be given at the top of each column, and not repeated on each line of the table. Tables should not normally be included in the body of the text, but should be typed on separate sheets. Their approximate position in the text should be indicated.

**Chemical Formulae.** These should be written as far as possible on a single horizontal line. With inorganic substances, formulae may be used, particularly in the experimental portion, at the discretion of the editors. With salts it must be stated whether or not the anhydrous material is used, e.g. anhydrous  $\text{CuSO}_4$ , or which of the different crystalline forms is indicated, e.g.  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ,  $\text{CuSO}_4 \cdot \text{H}_2\text{O}$ .

**Description of Solutions.** Solutions of common acids, bases and salts are preferably defined in terms of normality ( $N$ ) or molarity ( $M$ ), e.g.  $N\text{-HCl}$ ;  $0.1M\text{-NaH}_2\text{PO}_4$ . The term '%' must be used in its correct sense, i.e. g./100 g. of solution. 10% HCl means 10 g. of hydrogen chloride in 100 g. of aqueous solution, and should never be used to indicate a ten-fold dilution of laboratory concentrated hydrochloric acid. For 'per cent by volume', i.e. ml./100 ml., the term '% (v/v)' may be employed. To indicate that a given weight of substance is contained in 100 ml. of solution, the term '% (w/v)' (weight per volume) may be used.

**Symbols and Abbreviations.** Authors should refer to current numbers of the *Biochemical Journal* for information in this connexion. The chemical nomenclature adopted is that followed by the Chemical Society (see *J. chem. Soc.* 1936, p. 1067). With a few exceptions the symbols and abbreviations are those adopted by a committee of the Chemical, Faraday and Physical Societies in 1937 (see *J. chem. Soc.* 1944, p. 717). Spectrophotometric terms and symbols are those proposed by the Society of Public Analysts and other Analytical Chemists (see *The Analyst*, 1942, 67, 164). The attention of authors is particularly drawn to the following symbols:  $m = (\text{milli}) = 10^{-3}$  and  $\mu = (\text{micro}) = 10^{-6}$ . Note also that ml. (millilitres) should be employed instead of c.c., and  $\mu\text{g}$ . (micrograms) instead of  $\gamma$ .

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## Nomenclature of Amino-acids

The following rules have been agreed upon between the Editors of the *Journal of the Chemical Society* and of the *Biochemical Journal*, after consultation with their American colleagues. The examples are given solely to illustrate the application of the rules; in other respects (e.g. the method of enumeration of carbon atoms) names will naturally follow the customary usages of the journal in which they are to appear.

**RULE 1.** In cases where no possibility of misunderstanding can arise regarding which isomer of the amino-acid is under discussion, the amino-acid may be named without prefix or symbol to denote the direction of the rotation.

**RULE 2.** In cases where distinction between the stereoisomers is necessary, or considered desirable for the sake of clarity, the configurational family to which the *alpha carbon atom* belongs should be designated by a prefixed *small capital letter*. An additional sign to denote the direction of the rotation is not necessary.

*Examples:* L-leucine, D-valine.

The optically inactive mixture or racemic compound should, except where Rule 1 applies, be designated with the prefix DL.

*Example:* DL-leucine.

**RULE 3.** The configuration of carbohydrates and other compounds which can be configurationally related to glyceraldehyde is designated by a prefixed D or L. Where confusion is possible between the use of the small capital letter prefix for the configuration of the *alpha carbon atom* in amino-acid nomenclature and for that of the highest numbered asymmetric carbon atom in carbohydrate nomenclature, a subscript is added to the small capital letter prefix. Where the prefix is used in the amino-acid sense, the subscript 's' is added; where the prefix is used in the carbohydrate sense, the subscript 'g' is added. These subscripts refer, respectively, to serine, the fundamental substance to which amino-acids that bear structural resemblance to the carbohydrates can be formally related, and to glyceraldehyde, the fundamental substance to which the configuration of the carbohydrates is formally related.

*Examples:* L<sub>s</sub>-threonine, for which the synonym in carbohydrate nomenclature is 2-amino-2:4-dideoxy-D<sub>g</sub>-threonic acid; D<sub>s</sub>-threonine, for which the synonym is 2-amino-2:4-dideoxy-L<sub>g</sub>-threonic acid; L<sub>s</sub>-allothreonine, for which the synonym is 2-amino-2:4-dideoxy-L<sub>g</sub>-erythronic acid; D<sub>s</sub>-allothreonine, for which the synonym is 2-amino-2:4-dideoxy-D<sub>g</sub>-erythronic acid.

Papers that deal with both carbohydrates and amino-acids and which make use of the prefixes should employ subscripts at least for the names of the amino-acids. The acids derived from amino sugars should be named in conformity with carbohydrate nomenclature but with the use of the subscript: e.g. D<sub>s</sub>-glucosaminic acid for 2-amino-2-deoxy-D<sub>g</sub>-gluconic acid.

**RULE 4.** If the configurational relationship of the *alpha carbon atom* has not been definitely established, the actual direction of the rotation in a specified solvent, preferably of the free amino-acid in water, is designated by the prefixes *dextro* or *laevo* or, alternatively, by a plus or a minus sign enclosed in parenthesis.

*Examples:* dextrohydroxytryptophan, (+)-hydroxytryptophan.

**RULE 5.** The prefix *meso* should be used for the *meso* isomers of amino-acids and their derivatives that are optically inactive because of internal compensation.

*Example:* mesolanthionine, mesocystine.

**RULE 6.** Where the amino-acid has two asymmetric centres, but where internal compensation is impossible, the form which occurs in proteins should be called the L-amino-acid, and the form which has opposite configuration on both asymmetric carbon atoms should be designated the D-amino-acid. The pair having opposite configurations on one asymmetric centre only should be designated D-*allo* and L-*allo*, D and L referring as usual to the *alpha carbon atom*.

*Examples:* D-*allo*threonine, L-*allo*hydroxyproline.

**RULE 7.** Derivatives and salts of amino-acids and peptides should, where necessary, be named with the use of D or L to denote the configurational family of the *alpha carbon atom* or *atoms*, the customary rules being otherwise observed.

*Examples:* acetyl-L-tryptophan, L-histidine monohydrochloride monohydrate, copper L-aspartate, D-leucyl-D-valine.

**RULE 8.** Where a trivial name is applied to a compound that contains two alpha amino carboxylic acid groupings attached to dissimilar carbon chains, the configurational designation is that of the *alpha carbon atom* of the *smaller of the two chains*.

*Examples:* D-cystathionine for S-(D-β-amino-β-carboxyethyl)-D-homocysteine, L-allocystathionine for S-(L-β-amino-β-carboxyethyl)-D-homocysteine.

It is emphasized that the introduction of new trivial names should be avoided.