INSTRUCTIONS TO AUTHORS

The Journal of Biochemistry
Published by
The Japanese Biochemical Society (2009)

The Journal of Biochemistry publishes the results of original research in the fields of Biochemistry, Molecular Biology, Cell, and Biotechnology written in English in the form of Regular Papers or Rapid Communications. A Rapid Communication is not a preliminary note, but it is, though brief, a complete and final publication. The materials described in Rapid Communications should not be included in a later paper. The Journal also publishes short reviews (JB Review) and papers solicited by the Editorial Board. The submission of a manuscript implies that the work described has not been published previously, that it is not under consideration for publication elsewhere, and that if it is accepted for publication, the author(s) will grant the Japanese Biochemical Society an exclusive license to publish. **Submission should be made through the online submission system at http://mc.manuscriptcentral.com/jb. We no longer handle submission by post. For further information on online submission, please see: Instructions for Online Submission** (http://www.oxfordjournals.org/jbchem/for_authors/auth1.html).

I. GENERAL INFORMATION

On submission of a paper, **authors are requested to select one of the following four fields and its topic, under which the submitted paper should be reviewed, and to indicate their selection on the title page of the manuscript.**

Fields to be selected:

Biochemistry
Molecular Biology
Cell
Biotechnology

Topics to be selected:

Biochemistry: Biochemistry General; Protein Structure; Protein Interaction and Recognition; Biomolecular Structures; Nucleic Acid and Peptide Biochemistry; Glycobiology and Carbohydrate Biochemistry; Lipid Biochemistry; Enzymology; Enzyme Inhibitors; Biochemistry of Proteolysis; Metabolism and Bioenergetics; Reactive Oxygen and Nitrogen Species; Biochemistry in Cell Membranes; Biochemistry in Diseases and Aging; Neurochemistry; Immunochemistry; Physiological Chemistry; Biochemical Pharmacology; Analytical Biochemistry

Molecular Biology: Molecular Biology General; Genes and Other Genetic Materials; Replication and Recombination; Gene Expression; Protein Synthesis; DNA-Protein Interaction; RNA Processing; Genetic Engineering; Genetic Diseases; Molecular Genetics; Molecular Evolution; Bioinformatics

Cell: Cell General; Biomembranes, Organelles, and Protein Sorting; Muscles; Cytoskeletons, Cell Motility, and Cell Shape; Extracellular Matrices and Cell Adhesion Molecules; Cell Cycle; Receptors and Signal Transduction; Stress Proteins and Molecular Chaperones; Cell Death; Differentiation, Development, and Aging; Neurobiology; Tumor and Immunology

Biotechnology: Biotechnology General; Biomimetic Chemistry; Biomaterials; Bioactive Substances; Synthetic Peptides and Oligonucleotides; Gene and Protein Engineering; RNA Technology; Glycotechnology; Immunological Engineering; Cell and Tissue Engineering; Transgenic Technology; Gene Delivery Systems; Drug Delivery Systems; Biosensor and Bioelectronics; New Devices in Biotechnology; Environmental Technology

No definite limit of length is set for a **Regular Paper**, but all manuscripts should be as concise as possible. A concise well-written paper will usually reduce the time required for review and tends to be published more rapidly. **A Rapid Communication** should not exceed an equivalent of 3.5 printed pages including the spaces required for figures, tables, and references. In estimating this limit, note that one single typeset page is approximately 3.5 pages of a double-spaced type-written manuscript.

Manuscripts should be written in clear and concise, grammatical English. A contributor whose native language is not English is recommended to have the manuscript checked by a native speaker of English. The Journal will not assume the responsibility of polishing English.

A manuscript describing primary structures of biological macromolecules (proteins and nucleic acids) without sufficient data for their deductions within the limited page space is not acceptable as a Rapid Communication. **In the case of a Rapid Communication, the author should describe the urgency or necessity for the rapid publication in the cover letter.**

II. REVIEW PROCESS

Manuscript will be sent to at least two referees for evaluation. The JOURNAL always attempts to minimize the potential for conflict of interest in the review of manuscripts. Therefore, authors may request that a specific individual with a possible conflict of interest not be involved in reviewing the manuscript. Authors may suggest the names and addresses of a few potential reviewers. The Editors and Associate Editors will be guided but not necessarily bound by these suggestions.

Contributors will receive an email from one of the Editors or Associate Editors stating whether their manuscript is acceptable. Revised manuscripts should be submitted through the online submission system. Correspondence concerning manuscripts should be sent directly to the relevant Editor. Revised papers will be considered as newly submitted papers if they are not resubmitted within 2 months for no justifiable reason. Handling of manuscripts is free of charge. **Manuscripts will be published online at http://jb.oxfordjournals.org/ as "Advance Access" articles in 2 or 3 working days after acceptance. Authors should take care to follow instructions on Form and Style of Manuscript, as the pre-typeset manuscript will be published online. Authors who do not wish their papers to be published as "Advance Access" due to justifiable reason should contact the Editorial Office upon submission.** However, manuscripts will be published in a formal issue only after agreement by the author(s) to pay the costs of publication including Color Charge and Offprint Charge. Alteration in galley proofs, other than the correction of printer's errors, are not granted, except when the Editor admits inevitable addition of a brief note in proofs at the author's expense. Galley proofs corrected by authors should be returned to the printer by a designated date. Otherwise, the Editor reserves the right of proofreading. Reprints can be purchased, in lots of 50 copies, at cost prices. The orders should be submitted with the returned proof.

The members of the Editorial Board use the following guidelines to assist them in making editorial decisions. To inform prospective authors of our criteria, the guidelines are listed below, but please note that these are only guidelines. (1) Is the subject suitable for publication in the *Journal of Biochemistry*? (2) Is it an original contribution? (3) Is it a complete and final paper? (4) Is it clearly presented? (5) Are the summary and title informative? Do they reflect the contents of the paper? (6) Are the appropriate key words given? (7) Does the introduction contain statements sufficient to explain the aim of the work? (8) Are the methods sound? (9) Are the results relevant and sufficient? (10) Are the illustrations and tables necessary and acceptable? (11) Are the interpretations and conclusions justified by the data? (12) Are the references adequate; are all of them necessary? Does the list of references contain all the information?

In general, the *Journal of Biochemistry* will not publish papers that are: (1) Merely confirmatory or descriptive as to the presence of a well-known process in tissues or organisms not previously studied. (2) Not novel enough: purification of an enzyme or sequencing of a protein or nucleic acid which has already been reported for another species or organ, unless the manuscript includes novel findings or is of biological significance. (3) Too preliminary or incomplete: incomplete amino acid or nucleotide sequences, incomplete structures of natural compounds, incomplete NMR or other spectroscopic assignments, *etc*. (4) Deals only with the description of a new method or the preparation of a reagent such as a monoclonal antibody, unless it is novel or represents a substantial improvement. (5) Too specialized in areas outside the scope of the *Journal of Biochemistry*. (6) Just negative.

III. FORM AND STYLE OF MANUSCRIPT

Manuscripts should conform to the style and usage of the Journal as exemplified in current issues. They should be typed on A4 form (21×29.7 cm or 21.6×28 cm) with double-spacing throughout. Text should be double spaced, with font size between 10.5 to 11, and saved as a .DOC, or .RTF file. Separate pages should be used for the following: **(1) title page(s), (2) summary, (3) text, (4) footnote(s) to the text, (5) references, (6) table(s), (7) legend(s) to figure(s), (8) figures or other subsidiary matters, (9) supplementary data (if any), (10) declaration of Funding and Conflict of Interest.** The manuscripts should be arranged in the order indicated above and all pages should be numbered in succession except the figure(s), the title page being page 1. Indicate the appropriate location in the text of the tables, figures, and other subsidiary materials by marginal notes. Latin words should be italicized (for example: *in vitro, i.e., etc., per se*). Footnote(s) to the author's name(s) and affiliation(s) should appear on the page. All footnotes should be numbered in succession with superscript, Arabic numerals, starting from the title page footnote(s). Footnotes to tables should be identified with superscript lower case (a, b, *etc*.), and placed at the bottom of the table. Acknowledgement (if any) should appear after the main text, and before the References. It is advised that authors note any conflict of interest in this section.

IV. ORGANIZATION OF MANUSCRIPT

A desirable plan for the organization of a **Regular Paper** is as follows: **(a) SUMMARY, (b) INTRODUCTION** with no heading, **(c) EXPERIMENTAL PROCEDURES** or **MATERIALS AND METHODS**, **(d) RESULTS**, **(e) DISCUSSION**, **(f) REFERENCES**. In some cases, presentation will be clearer and more effective if the author combines some of these sections. For a **Rapid Communication**, a brief summary is requested, but headings and subheadings should be omitted.

1. Title Page(s)

Provide a title page(s), containing the following items.

(1) The form of the paper (Regular Paper or Rapid Communication). The field and its topic under which the paper is to be reviewed.

(2) Title. The title should be informative and as short as is consistent with clarity. The title should not include chemical formulae or arbitrary abbreviations, but chemical symbols may be used to indicate the structures of isotopically labeled compounds. The numbering of parts in a series of papers is not permitted, but titles and subtitles may be used if necessary.

(3) By-line. List full names of all authors. A footnote reference(s) to an author(s), indicating a change of address, should be given on the title-page.

(4) From-line. List the institution(s) in which the work was carried out, and the Zip Code, if available.

(5) Running title. Provide a short running title of less than 60 strokes. It should be as informative as possible.

(6) The name, complete mailing address, telephone number, Fax number and Email address of the person to whom correspondence should be sent. To expedite the review, much of the journal's correspondence will be by Email.

(7) Abbreviations. Non-standard abbreviations (see Section X-6, 7, and 8) should be defined, even if they are known to those familiar with the field. List all non-standard abbreviations used in the paper in alphabetical order in a footnote on the title page.

2. Summary

(1) Every paper should have summary. The summary should be concisely written in less than 200 words. Summaries of Rapid Communications should be limited to 100 words. The summary should briefly present the problem, suggest the scope of the work and the plan of experiments, mention significant data and state major findings and conclusions. Avoid statements such as "The significance of these results is discussed" that do not help the reader. The summary should be intelligible to the non-specialist as well as the specialist in your field, and hence should avoid specialized terms and abbreviations.

(2) Key words. Provide five key words identifying the nature of the subject matter **alphabetically** in the last part of the summary.

3. Introduction

The text of a **Regular Paper** should begin with a short introduction with no heading. This should state the reasons for performing the work, with brief reference to previous work on the subject. Avoid giving an extensive review of the literature.

4. Methods, Results, and Discussion

The arrangement of the paper after the introduction is not fixed. The author may separate sections with italicized subheadings.

The **Experimental Procedures** or **Materials and Methods** should give sufficient details to enable the reader to repeat your work exactly, if necessary. **The necessity for conciseness should not lead to omission of important experimental details**. Refer to previously published procedures employed by citation of both the original description and pertinent published modifications, and do not include extensive description unless they present substantially new modifications. Combination of the Results and Discussion in a single section sometimes gives a clearer and more compact presentation.

5. References

References cited in the text should be numbered in parentheses with italicized Arabic numerals in order of appearance. References to "unpublished experiments" and "personal communications" should appear parenthetically in the text following the name(s) of the source of information [(Yamada, T., personal communication), (Suzuki, M. and Yoshida, M., unpublished observations) *etc*.]. Be sure to verify the wording of any personal communication with the person who supplied the information and get his approval for the use of his name in connection with the quoted information. All references should be listed in numerical order typed double-spaced on a separate sheet under the heading REFERENCES. Please note the following examples.

(1) For a journal article:

7. Sanger, F., Nicklen, S., and Coulson, A.R. (1977) DNA sequencing with chain-terminating inhibitors. *Proc. Natl. Acad. Sci. USA* **74**, 5463–5467

(2) For a chapter in an edited book:

12. Messing, J. (1983) New M13 vectors for cloning in *Methods in Enzymology* (Wu, R., Grossman, L., and Moldave, K., eds.) Vol. 101, pp. 20–51, Academic Press, New York

(3) For a book by one or more authors:

15. Sambrook, J., Fritsch, E.F., and Maniatis, T. (1989) *Molecular Cloning. A Laboratory Manual* pp. 1339–1341, Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY

Text citations to references written by more than two authors should be styled for example as, Smith *et al*. In the reference list, however, the names of all authors (with initials) must be given. If an article has been accepted for publication by a journal but has not yet appeared in print, the reference should be styled as follows:

29. Tanahashi, H. and Ito, T. (1994) Molecular characterization of a novel factor recognizing the interleukin-6 responsive element. *J. Biochem*. (in press)

The use of "in preparation" and "submitted for publication" is not allowed in the reference list.

Citation of the references written in a language which is usually unreadable for general readers and those published in a journal (or book) to which general reader could not easily access should be avoided.

6. Figure Legends

Figure legends should be prepared for each figure. There should be sufficient experimental detail in the legend to make the figure intelligible without reference to the text (unless the same material has been given with a previous figure, or in the Experimental Procedures section).

7. Nucleotide Sequence

New nucleotide data must be submitted and deposited in the DDBJ/EMBL/GenBank databases and an accession number obtained before

the paper can be accepted for publication. Submission to any one of the three collaborating databanks is sufficient to ensure data entry in all. The accession number should be included in the manuscript *e.g*., as a footnote on the title page: "Note: Nucleotide sequence data reported are available in the DDBJ/EMBL/GenBank data-bases under the accession number(s)…". If requested, the database will withhold release of data until publication. The most convenient method for submitting sequence data is by World Wide Web:

DDBJ via SAKURA: http://sakura.ddbj.nig.ac.jp/
EMBL via WEBIN: http://www.ebi.ac.uk/embl/Submission/webin.html
GenBank™ via Banklt: http://www.ncbi.nlm.nih.gov/Banklt/
or stand-alone submission tool
Sequin: http://www.ncbi.nlm.nih.gov/Sequin/

For special types of submissions (*e.g*., genomes, bulk submissions, *etc*.) additional submission protocols are available from the above sites.

Database Contact Information

DDBJ: Center for Information Biology and DNA Data Bank of Japan National Institute of Genetics, 1111 Yata, Mishima, Shizuoka 411-8540, JAPAN; telephone: +81 559 81 6853; fax: +81 559 81 6849; e-mail: ddbj@ddbj.nig.ac.jp; web URL: http://www.ddbj.nig.ac.jp/

EMBL: EMBL Nucleotide Sequence Submissions, European Bioinformatics Institute, Wellcome Trust Genome Campus, Hinxton, Cambridge DB10 1SD U.K.; telephone: +44 1223 494499; fax: +44 1223 494472; e-mail: datasubs@ebi.ac.uk; web URL: http://www.ebi.ac.uk

GenBank: National Center for Biotechnology Information, National Library of Medicine, Bldg. 38A, Rm 8N-803, Bethesda, MD 20894, U.S.A.; telephone: +1 301 496 2475; fax: +1 301 480 9241; e-mail: info@ncbi.nlm.nih.gov; web URL: http://www.ncbi.nlm.nih.gov

V. PREPARATION OF TABLES

1. Tables should be drawn on separate pages and numbered consecutively in Roman numerals. For aid in designing tables in acceptable style, refer to current issues of the Journal.
2. Each table should have an explanatory title and sufficient experimental detail, usually in a paragraph immediately following the title, to be intelligible without reference to the text (unless the procedure is given in the Experimental Procedures section, or under another table or figure).
3. Indicate units of measure clearly.
4. Footnotes to tables should be kept to a minimum and should be indicated by superscript lower cases, at the bottom of the table.
5. **Table must be submitted as .DOC, .RTF, Excel or PowerPoint files.**

VI. PREPARATION OF ILLUSTRATIONS

1. Each figure (Scheme, Diagram) should be given on a separate file numbered with an Arabic numeral (Fig. 1, Fig. 2, *etc*.). Figures will be reduced to fit into the type area of the printed page (17.5×23.5 cm).
2. Indicate the magnification of photomicrographs in the legend or include a bar indicating the scale in the figure.
3. Flow diagrams and amino acid or nucleotide sequences should always be presented as direct photographic reproduction.
4. **Color figures will be printed at the expense of the authors. The cost will be GBP 350 per figure. Papers submitted with colored photographs will be reviewed on the assumption that the authors will pay for color costs. Switching a color figure to black and white figures after acceptance may require Editorial approval. If the figures should be reproduced as black and white, the author must provide black and white version of figure files when submitting the manuscript. Black and white figures will be printed without additional cost, but should be well prepared with high contrast.**
5. **Figures must be submitted as .DOC, .EPS, .JPG, .PPT, .TIF, .PDF or .GIF.**

VII. SUPPLEMENTARY DATA

Supporting material that cannot be included, and which is not essential for inclusion in the full text of the manuscript, but would nevertheless benefit the reader can be published online. Authors are encouraged to take advantage of the opportunity to submit Supplementary data whenever appropriate; for example, when the amount of material is too great to warrant inclusion in the main body of the paper, or when the material is in a format that cannot be represented in print (i.e. video clips or animated graphics). All material to be considered as Supplementary data must be submitted at the same time as the main manuscript for peer review. Please indicate clearly the material intended as Supplementary data upon submission. Also ensure that the Supplementary data is referred to in the manuscript at an appropriate point in the text. Supplementary data should be submitted in a separate file(s), in its final form. Please note that Supplementary data will not be edited, so ensure that it is clearly and succinctly presented, and that the style of terms conforms to the rest of the paper. Also ensure that the presentation will work on any internet browser.

Acceptable formats: A maximum of 10 files is acceptable to make up the supplementary data unit for the article. The maximum size per file should not exceed 1.5 MB. An HTML index page is usually created to link in the Supplementary data file(s). Please provide short (2–4 words) titles for each individual file—these will be used to create links to the files from the index page.

VIII. CHEMICAL AND MATHEMATICAL FORMULAE

1. Refer in the text to simple chemical compounds by their formulae when these can be printed in simple horizontal lines of type. Do not use structural formulae in the running text.
2. Ionic charge should be shown as a superscript following the chemical symbol, *e.g*. Fe^{3+}, SO_4^{2-}.
3. Prepare large structural formulae and long mathematical equations in a form suitable for direct photographic reproduction and include them as a Diagram at the end of the paper.
4. **Isotopically Labeled Compounds**—The symbol for an isotope is shown in square brackets directly before the name (word), as in [^{14}C]urea, [α-^{14}C]leucine, DL-[methyl^{14}C]methionine. When more than one position in a substance is labeled with the same isotope and the positions are not indicated, the number of labeled atoms should be indicated as a right-hand subscript; as in [$^{14}C_2$]glycolic acid. The symbol *U* indicates uniform, *e.g*. [*U*-^{14}C]glucose (where the ^{14}C is uniformly distributed among all six positions). The isotopic prefix precedes that part of the name to which it refers, as in sodium [^{14}C]formate, thiamine [β-^{32}P]diphosphate. Terms such as ^{131}I-labeled albumin should not be contracted to [^{131}I]albumin. When isotopes of more than one element are introduced, their symbols should be arranged in alphabetical order: *e.g*. L-[3-^{14}C, 2,3-^{2}H, ^{15}N]serine. The symbols ^{2}H and ^{3}H or D and T may be used for deuterium and tritium, respectively.

   For simple molecules, the labeling is indicated by writing the chemical formulae with the prefix superscripts attached to the correct atomic symbols in the formulae: *e.g*. $^{14}CO_2$, $H_2{}^{18}O$, $^{2}H_2O$. Square brackets should not be used for them, or when the isotopic symbol is attached to a word that is not a specific chemical name, abbreviation or symbol: *e.g*. ^{131}I-labeled, ^{14}C-sugar, ^{14}C-steroids, $^{32}PO_4^{3-}$, but [^{32}P]-phosphate.
5. **Spectrophotometric Data**—Beer's law may be stated as

$$A = -\log T = \varepsilon lc$$

Where A is the absorbance; T, the transmittance ($-I/I_0$); ε, the molar absorption coefficient; c, the concentration of the absorbing substances in moles per liter; and l, the length of the optical path in centimeters. Under these conditions ε has the dimensions $\text{liter} \cdot \text{mol}^{-1} \cdot \text{cm}^{-1}$ or more briefly $\text{M}^{-1} \cdot \text{cm}^{-1}$ (not $\text{cm}^{-} \cdot \text{mol}^{-1}$). Do not use "O.D." and "E."

IX. AUTHOR RESPONSIBILITY

In scientific investigations involving human subjects, experiments should be performed in accordance with the ethical standards formulated in the Helsinki Declaration of 1964 (revised in 1989, *cf*. http://ohsr.od.nih.gov/). Similarly, animal experiments should follow the ethical standards formulated in the Helsinki Declaration, and measures taken to protect animals from pain or discomfort should be mentioned. All authors must read and sign the JB Authors' Responsibility and Conflict of Interest Form. This form can be downloaded from http://www.oxfordjournals.org/our_journals/jbchem/for_authors/jbcoiform.pdf.

Authorship: All persons designated as authors should qualify for authorship. The entitlement to authorship should be based on all of the following criteria: (1) substantial contributions to conceptions and design, execution or analysis and interpretation of data; (2) drafting the article or revising it for important intellectual content; (3) final approval of the version to be published. Acquisition of funding, collection of data, or general supervision of the research group, alone, does not justify authorship. All contributors who do not meet the criteria for authorship should be listed in the Acknowledgements. The order of authorship should be a joint decision of the co-authors. Each author should have participated sufficiently in the work to take public responsibility for part of the content or the whole.

Submitting author must agree that above has been confirmed by all authors when submitting a manuscript, and fax the signed Authors' Responsibility and Conflict of Interest form to the Editorial Office (+81-3-3815-1913).

For more details on Authorship: International Committee of Medical Journal Editors' (ICMJE) Uniform Requirements for Manuscripts Submitted to Biomedical Journals.

Conflict of Interest: The *Journal of Biochemistry*'s policy requires that each author reveal any financial interests or connections, direct or indirect, or other situations that might raise the question of bias in the work reported or the conclusions, implications, or opinions stated including pertinent commercial or other sources of funding for the individual author(s) or for the associated department(s) or organization(s), personal relationships, or direct academic competition.

When considering whether you should declare a conflicting interest or connection please consider the conflict of interest test: Is there any arrangement that would embarrass you or any of your co-authors if it was to emerge after publication and you had not declared it?

As an integral part of the online submission process, Corresponding authors are required to confirm whether they or their co-authors have any conflicts of interest to declare, and to provide details of these.

When submitting a manuscript, the corresponding author is required to submit a completed Authors' Responsibility and Conflict of Interest form to the Editorial Office by FAX (+81-3-3815-1913).

Funding: Details of all funding sources for the work in question should be given in a separate section entitled 'Funding'. This should appear before the 'Reference' section. The following rules should be followed: the full official funding agency name should be given, i.e. 'National Institutes of Health', not 'NIH'; grant numbers should be given in brackets; multiple grant numbers should be separated by a comma; agencies should be separated by a semi-colon; no extra wording like 'Funding for this work was provided by ...' should be used; where individuals need to be specified for certain sources of funding the following text should be added after the relevant agency or grant number 'to [author initials]'.

An example is given here: 'National Institutes of Health (CB5453961 to C.S., DB645473 to M.H.); Funding Agency (hfygr667789).'

X. TERMINOLOGY AND ABBREVIATIONS

1. Abbreviations with specific meanings may be used for convenience for complex chemical substances, particularly in equations, tables, or figures. Avoid using abbreviations in titles and summaries except the standard ones listed in Table II of Section X-8.
2. Use abbreviations and symbols sparingly in the text. In chemical equations, which traditionally depend upon symbols, an abbreviation or symbol may be used for a term that appears in full in the neighboring text. Trivial names are usually sufficiently short not to require abbreviations.
3. An abbreviated name or symbol in a column heading in a table, figure, or photograph must either be taken from the "accepted" list given in Section X-8 or formulated in accordance with the principles of Section X-6.
4. For spelling of chemical names consult current issues of the Journal. For chemical terms follow essentially the usages and rules recommended by International Scientific Union, especially Nomenclature Committee of IUBMB (NC-IUBMB, IUBMB: International Union of Biochemistry and Molecular Biology) and IUPAC-IUBMB Joint Commission on Biochemical Nomenclature (JCBN, IUPAC: International Union of Pure and Applied Chemistry): see the recommendations in *Biochemical Nomenclature and Related Documents* (1978), available from The Biochemical Society, 7 Warwick Court, London WC1R 5DP, U.K. and in *Biochemical Nomenclature and Related Documents. A Compendium*, 2nd edn (Liébecq, C., ed.), Portland Press Ltd, London (1992). (see *Eur. J. Biochem*. **213**, 1–3 (1993)).
   Refer also to http://www.chem.qmw.ac.uk/iupac/jcbn/
5. **Enzymes**—Where one or more enzymes figure prominently in a manuscript, authors should use the recommended (trivial) name or systematic name given by Nomenclature Committee of IUBMB and IUPAC-IUBMB Commission on Biochemical Nomenclature: see
   Enzyme Nomenclature, Recommendations (1992), Academic Press, Inc.,
   see also *Eur. J. Biochem*. **213**, 1–3 (1993).
   —Supplement *Eur. J. Biochem*. **223**, 1–5 (1994).
   —Supplement 2 *Eur. J. Biochem*. **232**, 1–6 (1995).
   —Supplement 3 *Eur. J. Biochem*. **237**, 1–5 (1996).
   —Supplement 4 *Eur. J. Biochem*. **250**, 1–6 (1997).
   When an enzyme is the main subject of a paper, its source, trivial name, systematic name (or the reaction that it catalyzes) and code number (preceded by "EC") should be included.
6. **Non-Standard Abbreviations**—Use of abbreviations other than the standard ones listed in X-7 and X-8 should be kept to a minimum. Such abbreviations should be introduced only when absolutely necessary, as in tables, figures, and other illustrations where space is particularly limited. Abbreviations are usually not needed in the text of a paper where repeated use of long names can be avoided by judicious use of pronouns, or by paraphrasing with words such as "the substrate," "the inhibitor," "the methyl derivative," *etc*. **All non-standard abbreviations used in the text should be defined in alphabetical order in a single footnote on the title page**.
7. **Abbreviations of Units of Measurement and Physical and Chemical Quantities**—These abbreviations listed in Table I may be used without definition.

TABLE I

(1) Prefixes to the names of units					
tera	10^{12}	T	milli	10^{-3}	m
giga	10^{9}	G	micro	10^{-6}	μ
mega	10^{6}	M	nano	10^{-9}	n
kilo	0^{3}	k	pico	10^{-12}	p
Deci	10^{-1}	deci (not d)	femto	10^{-15}	f
centi	10^{-2}	c[1)]	atto	10^{-18}	a
(2) Units of Concentration[2)]					
molar (moles/liter)			M		
millimolar (millimoles/liter)			mM (not 10^{-3} M)		
micromolar (micromoles/liter)			μM (or 10^{-6} M)		
nanomolar (nanomoles/liter)			nM (or $\times 10^{-9}$ M)		
picomolar (picomoles/liter)			pM (or $\times 10^{-12}$ M)		
(3) Units of Length					
meter			m		
centimeter			cm		
millimeter			mm		
micrometer (not micron)			μm (not μ)		
nanometer			nm (not μ)		
Ångstrom (0.1 nm)			Å		
(4) Units of Area and Volume					
square centimeter			cm^2		
cubic centimeter			cm^3		
liter			l (in tables only)		
milliliter			ml		
microliter			μl (not λ)		
(5) Units of Mass					
gram			g (kg, mg, μg [not γ], ng, pg)		
dalton[3)]			Da		
(6) Units of Time					
hour	h	year	yr		
minute	min	month	mo		
second	s	week	wk		
		day	d		

(7) Units of Radioactivity	
becquerel	Bq (= 1 dps or 60 dpm)
counts per minute	cpm
curie(s)	Ci ($=3.7\times10^{10}$ Bq)
disintegrations per minute	dpm
(8) Other Units	
mole	mol (mmol, μmol, nmol, pmol)
degree Celsius	°C
degree absolute (kelvin)	K
joule	J
kilojoule	kJ
calorie	cal
kilocalorie	kcal
parts per billion	ppb
parts per million	ppm
cycles per second (hertz)	Hz (not cps)
equivalent	eq
ampere	A (mA)
ohm	Ω
volt	V
gauss	G
pascal	Pa
revolutions per minute	rpm
Svedberg unit of sedimentation coefficient (10^{-13} s)	S
(9) Physical and Chemical Quantities	
absorbance	A
equilibrium constant	K
rate constant	k
maximum velocity	V_{max}
Michaelis constant	K_m
equilibrium dissociation constant	K_d
isoelectric point	pI
molecular weight[3]	M_r
retardation factor	R_f
acceleration of gravity	g
specific rotation	$[\alpha]^t_\lambda$
partial specific volume	$\bar{\nu}$
diffusion constant	D
sedimentation coefficient	s
density	ρ
sedimentation coefficient in water at 20°C, extraporated to zero concentration	$s^0_{20,w}$
Gibbs energy change	ΔG
entropy change	ΔS
enthalpy change	ΔH
melting temperature	T_m
(10) Other Terms	
logarithm	log
logarithm (natural)	ln
standard deviation of a series	SD
standard error of mean of series	SE

[1] to be avoided where possible (except for cm).
[2] Terms such as milligram percent (mg%) should not be used. Weight concentrations should be given as g/ml, g/100 ml, *etc.*
[3] Molecular weight is dimensionless. Only molecular mass is expressed by daltons.

8. **Accepted Abbreviations and Symbols**—Authors may use, without definition, the abbreviations given in Table II and the symbols and abbreviations for amino acid or nucleotide residues in polymers or sequences. Define other abbreviations in a single footnote on the title page.

TABLE II

(1) General	
Adenosine 3′:5′-cyclic monophosphate	cAMP
Adenosine 5′-mono-, di, and triphosphates[1]	AMP, ADP, and ATP
Adenosine triphosphatase	ATPase
Base pair(s)	bp
Bovine serum albumin	BSA
O-(Carboxymethyl)	CM-
Circular dichroism	CD
Coenzyme A and its acyl derivatives	CoA (or CoASH) and acyl-CoA
Complementary DNA	cDNA
Cyclic AMP	cAMP
Cyclic GMP	cGMP
Cytidine diphosphate choline, *etc.*	CDP-choline, *etc.*
Cytidine 5′-mono-, di-, and triphosphates	CMP, CDP, and CTP
Deoxyribonuclease	DNase
Deoxyribonucleic acid	DNA
O-(Diethylaminoethyl)	DEAE-
Dithiothreitol	DTT
Electron paramagnetic resonance	EPR
Electron spin resonance	ESR
Ethylenediaminetetraacetic acid	EDTA
[Ethylenebis(oxyethlenenitrilo)]-tetraacetic acid	EGTA
Flavin-adenine dinucleotide and its fully reduced form	FAD and $FADH_2$
Flavin mononucleotide and its fully reduced form	FMN and $FMNH_2$
Fourier transform	FT
Gas chromatography-mass spectrometry	GC-MS
Gas liquid chromatography	GLC
Glutathione and its oxidized form	GSH and GSSG
Guanosine 3′:5′-cyclic monophosphate	cGMP
Guanosine 5′-mono-, di-, and triphosphates	GMP, GDP, and GTP
Guanosine triphosphatase	GTPase
Hemoglobin	Hb
Heterogenous nuclear RNA	hnRNA
High performance (pressure) liquid chromatography	HPLC
4-(2-Hydroxyethyl)-1-piperazineethane-sulfonic acid	HEPES
Immunoglobulin	Ig (IgG, IgM, *etc.*)
Infrared	IR
Inorganic orthophosphate	P_i
Inorganic pyrophosphate	PP_i
Inosine 5′-mono-, di-, and triphosphates	IMP, IDP, and ITP
Kilobases	kb
Kilobase pairs	kbp
Lethal dose, 50%	LD_{50}
Messenger RNA	mRNA
Nicotinamide adenine dinucleotide and its reduced form	NAD^+ and NADH[2]
Nicotinamide adenine dinucleotide phosphate and its reduced form	$NADP^+$ and NADPH[2]
Nuclear magnetic resonance	NMR
Nuclear RNA	nRNA
Optical rotatory dispersion	ORD
Phosphoric acid residue	P- or -P
Pseudouridine and pseudouridine mono-nucleotide	ψ and ψMP
Polyacrylamide gel electrophoresis	PAGE
Poly(adenylic acid), polyadenylate[3]	Poly(A)[3]
Polymerase chain reaction	PCR
Restriction fragment length polymorphism	RFLP
Ribonuclease	RNase
Ribonucleic acid	RNA
Ribosomal RNA	rRNA
Ribosylthymine 5′-mono-, di-, and triphosphates	TMP, TDP, and TTP
Sodium dodecyl sulfate	SDS
Thin layer chromatography	TLC
Thymidine (2′-deoxyribosylthymine) 5′-mono-, di-, and triphosphates	dTMP, dTDP, and dTTP[4]
Transfer RNA	tRNA
Tris(hydroxymethyl)aminomethane	Tris
Ultraviolet	UV
Uridine diphosphate glucose, *etc.*	UDP-glucose, *etc.*
Uridine 5′-mono-, di-, and triphosphates	UMP, UDP, and UTP
(2) Amino acids	
Alanine	Ala (A)
Arginine	Arg (R)

Asparagine	Asn (N)
Aspartic acid	Asp (D)
Aspartic acid or asparagine	Asx (B)
Cysteine	Cys (C)
Glutamic acid	Glu (E)
Glutamine	Gln (Q)
Glutamic acid or glutamine	Glx (Z)
Glycine	Gly (G)
Histidine	His (H)
Isoleucine	Ile (I)
Leucine	Leu (L)
Lysine	Lys (K)
Methionine	Met (M)
Phenylalanine	Phe (F)
Proline	Pro (P)
Serine	Ser (S)
Threonine	Thr (T)
Tryptophan	Trp (W)
Tyrosine	Tyr (Y)
Valine	Val (V)
(3) Nucleic acids	
Adenosine	A
Bromouridine	BrUrd or B
Cytidine	C
Dihydrouridine	D or hU
Guanosine	G
Inosine	I
6-Mercaptopurine ribonucleoside (6-thioinosine)	M or sI
'a nucleoside'	Nuc or N
Pseudouridine	ψ or Q[a]
'a purine nucleoside'	R
'a pyrimidine nucleoside'	Y
Thiouridine	S or sU
Thymidine (2′-deoxyribosylthymine)	dT
Uridine	U
Xanthosine	X
Phosphoric residue	-*P* or p

[1] The various isomers of adenosine monophosphate may be written 2′-AMP, 3′-AMP, or 5′-AMP (in case of possible ambiguity). A similar procedure may be applied to other nucleoside or deoxyribonucleoside monophosphates.
[2] $NAD(P)^+$ and NAD(P)H indicate either NAD^+ or $NADP^+$ and either NADH or NADPH, respectively.
[3] Similarly abbreviate oligo- and polynucleotides composed of repeating sequences or of unknown sequence of given purine or pyrimidine bases, *e.g.* oligothymidylate, oligo(dT); alternating copolymer of A and U, poly(A-U); random copolymer of A and U, poly(A,U).
[4] The d prefix may be used to represent the corresponding deoxyribonucleoside phosphates, *e.g.* dADP.

9. **Names of Animals, Plants, and Microorganisms**—The scientific names are Latin binomials and should be given in full in the title and summary and on first mention in the text (*e.g. Escherichia coli*). Subsequently, the generic name may be contracted (usually to the first letter), *e.g.*, *E. coli*. The strain of laboratory animals and if possible the source should be stated.
10. The cytochromes should be designated by a small italicized letter, *e.g.* cytochrome *a*, b_2, c_1, *etc*.

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