

Instructions to Authors

General rules

1. *Bioscience, Biotechnology, and Biochemistry (Biosci. Biotechnol. Biochem.)* publishes previously unpublished papers in the various fields mentioned in its name.
2. Manuscripts will be dated as “received” on the day of their receipt by the Society and as “accepted” on the day when they are accepted for publication. The manuscripts that do not conform to the journal instructions would not be accepted.
3. The copyright of the material published in the journal is held by the Society.
4. Manuscripts must be in English.
5. All authors of a manuscript must have agreed to its submission and are responsible for its content. They must also have agreed that the corresponding author has the authority to act on their behalf in all matters pertaining to the publication of the manuscript.
6. By publishing, the authors agree that any material newly described in the paper will be made available for noncommercial purposes in a timely fashion and at a reasonable cost to members of the scientific community.
7. In manuscripts describing research on humans, it should be stated whether the study complied with the code of ethics of the World Medical Association (Helsinki Declaration of 1964, as revised in 2002). Reports of research on animals should state whether the protocol was approved by the appropriate committee of the institute where the research was carried out in line with the guidelines for the care and use of laboratory animals. Manuscripts that do not conform to the specifications of the guidelines will not be accepted for publication by the Society.

Categories of papers

The Journal publishes papers in the categories of **Regular Papers, Communications, Notes, and Reviews**. All papers must be original.

Regular Papers

Regular Papers should describe valuable new information and should be submitted in their final complete form.

Communications

Communications should describe an important finding or conclusion that is of particular interest, in order to justify the publication of the paper as a preliminary report. As a rule, communications should not exceed three printed pages.

Notes

Notes can describe a finding in a specialized field, a new experimental method, or something similar, which might not be suitable for publication as a Regular Paper but needs to be published. Notes should not exceed three printed pages.

Review

A Review should be on a topic of any subject that is within the scope of the journal. The publication of Reviews is by invitation only; a potential author for Reviews is contacted by one of the Editors. The submitted manuscripts will be reviewed by an Editor and reviewers.

Reviewing process

1. An editor is assigned to manage the reviewing process of each manuscript and is chosen on the basis of the research field to which the paper is a contribution. The editor then selects two or more referees to evaluate the manuscript, and subsequently, makes a final decision on the suitability of the paper based on the opinions of the referees.
2. The authors should provide clear responses to any comments or questions of the editor. The revised manuscript and the authors' responses should be sent directly to the editor-in-charge. If a manuscript is not returned to the editor within three weeks (except for reasons accepted by the editor), it will be assumed that the paper has been withdrawn by the authors. If the authors decide to withdraw their paper from consideration for publication, they should inform the editor of the same.
3. When the editor decides to accept a manuscript, it will be sent for English language editing by a rewriter selected by the Society. The edited manuscript will be returned to the authors to check the meanings of the revised sentences. The retyped manuscript should be returned to the Society. The author may be charged in case of extensive rewriting.

Preparation of manuscripts

1. General

- 1.1 Manuscripts should contain clear and accurate accounts of research. Unnecessary repetition (by duplicating the results in figures and tables or data in the text and a table) should be avoided. Times font is preferred. Do not use boldface print for sentences.
- 1.2 If the manuscript has not been prepared in the correct format, it may be returned for revision. Refer to the recent issues of this journal while preparing manuscripts and follow the same organization and style.
- 1.3 The manuscript should be prepared on a word processor using the A4 (210 × 297 mm) page setting.
- 1.4 The manuscript should be typed with margins not less than 3 cm wide on all sides. A page should be typed such that it contains 60 characters, including spaces, on each line, with 28 lines on a page. In this format, four pages of a manuscript will be equivalent to one printed page in the journal. The manuscript should be typed in a font not smaller than 12 points.

(2)

- 1.5 Manuscripts should be typed only on one side of the paper.
- 1.6 Do not justify the margins (do not make a straight right margin). Start each paragraph with an indentation of five spaces.
- 1.7 Do not divide words at the right margin.
- 1.8 Mark the desired position of tables and figures with a note in red ink at the right margin using a function of word processor.
- 1.9 Use word processor's functions to apply italics, boldface, and small capitals. (However, do not use boldface for the abstract.) If this is not possible, indicate italics with a single underline, boldface with a wavy underline, and small capitals with a double underline. Do not italicize a word and underline it.
- 1.10 All pages must be numbered at the center of the bottom margin, starting with the title page.
- 1.11 Add line numbering throughout the document, beginning with the number 1 on each page.
- 1.12 Supplemental information (Figures, Tables, *etc.*) can be added as Supplementary Materials (Regular Paper or Communication). The Supplemental of an accepted manuscript should basically be made public through the Internet. See Tips of "Guide for Submission (for non-Japanese authors)."

2. Form of papers

- 2.1 **Regular Papers** must be divided into sections in the following order: (1) Abstract: Use no more than 150 words, (2) Key words: Write up to five key words following the abstract, using words or phrases that best define the contents of the paper. Avoid words of broad application that would not be useful in information retrieval, (3) Introduction, (4) Materials and Methods, (5) Results, (6) Discussion: Alternatively, a combined Results and Discussion section may be prepared, (7) References, (8) Tables, (9) Figure legends, and (10) Figures. Materials and Methods may be placed before References as Experimental.
- 2.2 **Communications** should not be divided into sections. The abstract should not exceed 100 words, and up to five key words should be provided. The manuscript, including tables, figure legends, and figures, in that order, should not exceed 12 pages (no longer than 3 pages when printed).
- 2.3 **Notes** should not be divided into sections. The abstract should not exceed 60 words, and up to five key words should be provided. The manuscript, including tables and figures (which should not number more than three, taken together), should not exceed 6 pages (not more than three printed pages).

3. Title page and key words

- 3.1 The order and contents of the title page, numbered page 1, should be as follows:
 - 1) A running title;
 - 2) Title of the article;
 - 3) Full names of the authors;
 - 4) Names and complete addresses of Institution where

the research was carried out.

- 5) Footnote containing the phrase "† To whom correspondence should be addressed (use the dagger mark)" along with fax and e-mail address of the corresponding author. If the affiliation(s) where the work was carried out differ from the present affiliation(s) of the author(s), provide the present address of the author for mailing purposes.
- 6) Complete list of abbreviations in an alphabetical order and the words or phrases they represent. Do not list the approved abbreviations (see below). The content of the cover page can extend to page 2. However, in this case, the text will begin on page 3.
- 3.2 The title should be a concise statement of the article's major contents. It should not include abbreviations (with the exception of those listed below in sections 10 and 11 and in the tables) or chemical formulae.
- 3.3 A running title, which must be an abbreviated version of the title, should appear at the top of every printed page. It should not exceed 60 characters, including spaces. Commonly used abbreviations (such as "ATP"), simple chemical structures (such as "O₂"), and the short form of binomial Latin names for organisms (such as "*E. coli*") may be used (see sections 10 and 11 and the tables below).
- 3.4 All tables and figures should be numbered in the order of their appearance, *e.g.*, Table 2 and Fig. 4. However, the word "Figure" should not be abbreviated at the start of a sentence.
- 3.5 References in the text. The references should be numbered in the order of their appearance in the text, and the numbers in the text should be superscripted (*e.g.*, ¹ or ¹⁻³) after a mention of the contents or author(s).
- 3.6 References not (yet) available. References to articles submitted for publication but not accepted, unpublished articles, or personal communications should not be included in the reference list. Such citations should be inserted in parentheses at appropriate places in the text.
Examples: (Kornberg A, personal communication)
(Kaneko R and Sueoka N, unpublished results)
- 3.7 In the text, only the family names of the authors must be used, unless initials are required in order to avoid confusion among authors sharing same family names. If a reference includes two authors, both the authors' names should be mentioned. If there are three or more authors, use "*et al.*" after the first author's name.
- 3.8 Abbreviations and symbols that require explanation should be used as sparingly as possible (see sections 10 and 11 below). Define such abbreviations at their first occurrence in the text, and provide the abbreviation or symbol in parentheses. List all such abbreviations on the title page under the heading "Abbreviation" or "Abbreviations." Do not use the nonstandard abbreviations (those not listed in sections 10 and 11 and tables below) in the title, running title, or abstract.
- 3.9 In the case of a footnote, mark the relevant part in

the text with an asterisk, and type an unbroken line after the last line of the text on that page. Type the footnote below that line. In case more than one footnote appears on a page, use different numbers of asterisks to indicate different footnotes.

4. References

- 4.1** All references cited should have individual reference numbers.
- 4.2** References should be numbered in the order of their appearance in the text.
- 4.3** With regard to authors' names, the family name followed by the initial(s) should be provided in the reference list. List all authors. List the first and last pages, and the year of publication in parentheses. See examples.
- a) References to journal articles
Provide the name of the journal, the volume number, the first and last pages of the article, and the year of publication (see examples below). Abbreviate journal names as in Biological Abstracts (BIOSIS) or Chemical Abstracts. Italicize the journal name, and provide the volume number in boldface type. For reference to a journal published in Japanese, write the full name of the journal in italicized letters, and mention "in Japanese" in parentheses after the journal name. When an article has been accepted, give the name of the journal in which it will appear, followed by "in press." If the volume number, pages, and the year of publication are available later, add this information during the revision of the manuscript or galley proof.
- 1) Hoshino T, Kobayashi K, Ishibashi E, and Hashimoto S, *Biosci. Biotechnol. Biochem.*, **59**, 602–609 (1995).
 - 2) Sasaki K, Iwanaga C, Watanabe M, Suzuki K, Hamaoka T, and Kondo S, *Nippon Nōgeikagaku Kaishi* (in Japanese), **70**, 1103–1116 (1996).
 - 3) Sue M, Miyoshi H, and Iwamura H, *Biosci. Biotechnol. Biochem.*, in press.
- b) References to books
- 4) Lenton JR and Appleford NEJ, "Gibberellins," eds. Takahashi N, Phinney BO, and MacMillan J, Springer-Verlag, New York, pp. 125–135 (1990).
- c) References to patents
- 5) Kunstman MP and Prote JN, U.S. Patent, 3803306 (Apr. 9, 1974).
 - 6) Yamaguchi H, Sato S, and Takada K, Japan Kokai Tokkyo Koho, 85259190 (Dec. 21, 1975).

5. Tables

- 5.1** Tables should be numbered consecutively with Arabic numerals as Table 1, Table 2, and so on. Each table should appear on a separate page of the manuscript.
- 5.2** The title of the table should explain its contents. Tables should be self-explanatory. Further, the data provided in Materials and Methods or tables or figures should not be repeated; instead, the reader should be referred there.
- 5.3** Use abbreviations (those used in Chemical Abstracts) and words or short phrases to label each column and row in the table.
- 5.4** The width of the table should be in consideration

with the width of a full page of the journal, *i.e.*, 120 spaces or the width of a column, *i.e.*, 60 spaces.

6. Figures

- 6.1** Original artwork or a clear copy of the original artwork of the authors will be used for printing. Unsuitable figures will be returned to the authors for revision.
- 6.2** Each figure should appear on a separate page of the manuscript. All figures should be numbered (*e.g.*, Fig. 1) near the bottom edge along with the name of the first author. The top of the figure should be marked, if necessary.
- 6.3** All figure legends should be provided on a separate page, not on the page with the figure. The legends should be numbered and self-explanatory. Further, data provided in Materials and Methods or in the other figure legends should not be repeated but merely referred to. Leave a line space between the caption and the explanation of each figure, and two line spaces between the legends of different figures.
- 6.4** Use white paper measuring 210 × 297 mm for the figures. However, the final size of the figures will be decided by the Society.
- 6.5** Leave at least a 3-cm margin on all sides of the figure.
- 6.6** Both the *x*- and *y*-axes of figures should be marked with scale and numbers. Letters and numerals should be of a size such that it would permit reduction without loss of legibility.
- 6.7** The symbols ○ ● △ ▲ □ ■ × can be used in this order in figures to plot the results of measurements. Lines such as —, ·····, —, and can also be used. Do not draw a smoothed line without plots of the actual results.

7. Photographs

- 7.1** All photographs should be numbered and treated as figures.
- 7.2** The size of the photographs may be reduced for printing, similar to figures (see section 6.4 above). However, on the request of the authors, electron micrographs will not be reduced in size, provided they can be printed on one page. A bar should be included to show the scale for all photomicrographs.
- 7.3** If a color photograph is to be printed in black and white, please provide a black-and-white print.

8. Structural formulae

- 8.1** For the representation of structural formulae, refer to the directions provided for the preparation of figures (sections 6.1 and 6.4).
- 8.2** If a structural formula is provided to show simply the structure of a compound, which is the subject of the paper, no numbers or legends are required; however, if it explains the steps in a reaction, the formulae should be numbered as figures or Scheme 1, Scheme 2, *etc.*, and otherwise treated as figures (see section 6).
- 8.3** The size of a structural formula is decided in the same manner as that of a figure.

(4)

9. Equations

Write equations as follows.

- (a) $i_a = 650nD^{1/2} \text{ cm}^{2/3} t^{1/6}$
(for an equation on a single line)
- (b) $E_a = E_0 - (RT/nF) \ln(a/a_0)$

10. Units

The Systéme International d'Unités (SI) should be used for physical quantities, but non-SI units (*e.g.*, liter, h) can also be used. Use units according to the list provided in Table 1. Different systems of units should not be used in the same manuscript (*e.g.*, “kg/cm²” and “bar”).

11. Abbreviations and symbols for chemical compounds

11.1 The common abbreviations provided in the list below, as decided by an international agreement, need not be defined at their first occurrence. The Society accepts the use of the abbreviations provided in Table 2 without any definition.

11.2 Follow the rules and recommendations of the IUPAC-IUB Commission* for the abbreviation of compound names in the field of biochemistry. In addition to the common name of an enzyme, the name recommended by the International Union of Biochemistry** should be provided. The Enzyme Commission (EC) number should be provided at the first occurrence of the enzyme in the text.

11.3 The authors should select unambiguous abbreviations or use atomic symbols for chemical compounds mentioned in the description of the experiments, including reagents, solvents, and simple functional groups, in order to prevent misunderstanding. In the name of a single compound, symbols, abbreviations, and chemical names should not be mixed. Correct examples: Me, Et, Pr, Bu, Ph, AcOH, Bz, Ar, X, CO₂H, *iso*-BuOH

11.4 Follow the rules of IUPAC for the nomenclature of organic and inorganic compounds.*

11.5 Use names, not chemical formulae, when writing the name of a chemical in the text.

11.6 Radioactive compounds. The isotopic prefix in the name of an isotopically labeled compound should be provided in square brackets immediately before the part of the name to which it refers. Example: sodium [¹⁴C] formate. When the position(s) of a radioactive label is known, represent the compound as [2,3-³H]alanine. In case of uniform labeling, represent the compound as [U-¹⁴C]glucose. When the labeled material is not a chemical compound, represent the compound without square brackets, *e.g.*, ¹⁴C-ribosomes or ³²P-labeled.

* “Biochemical Nomenclature and Related Documents,” 2nd ed, Portland Press, London, 1992. Also <http://www.chem.qmul.ac.uk/iupacWbibliog/white.html> (December 2002)

** “Enzyme Nomenclature 1992: Recommendations of the Nomenclature Committee of the International Union of Biochemistry and Molecular Biology,” Academic Press, New York, 1992. Also <http://www.chem.qmul.ac.uk/iubmb/enzyme/> (December 2002)

11.7 Naming of chemical compounds

- a) Italics should be used for *o*- (ortho), *m*- (meta), *p*- (para), *n*- (normal), *sec*- (secondary), *tert*- (tertiary), *cis*-, *trans*-, *gauche*-, *erythro*-, *threo*-, *syn*-, and *anti*-. Italics should also be used for the specification of optical activity or inactivity such as *d*- (dextro), *l*- (laevo), *dl*- (racemic), and *i*- (inactive), and for substituted atoms such as *N*-, *O*-, and *C*-.
- b) Small capitals D-, L-, and DL- are used to express the configuration of sugars and amino acids. Absolute configurations of asymmetric centers are written as (*R*) and (*S*) or as (*E*) and (*Z*) for geometric isomers. For the description of the relative configuration in ring compounds, *cis* and *trans* are used.

12. Scientific names of organisms

The binomial Latin names for organisms should be written in italics.

13. Numbers

13.1 Numbers should be written as Arabic numerals. In sentences, write “zero” not “0.”

13.2 When a number begins a sentence, it should be spelled out along with its unit of measurement (*e.g.*, Five grams). Units that are not immediately preceded by a numeral (*e.g.*, per milliliter) should be spelled out. Decimal numbers should be represented as “0.1234.” A multiplication symbol “×” should be used, *e.g.*, “6.02 × 10²³” not “6.02 · 10²³.” Numbers greater than four-digit numbers should be separated by commas every three places. However, four-digit numbers need not be separated by commas (*e.g.*, IR wave number as given in section 14).

14. Description of the results of analytical tests

The results of analytical tests should appear in the Materials and Methods section. Write in a simple form, using abbreviations for the names of methods, units, values, and assignments.

$[\alpha]_D^{20} - 35^\circ$ (*c* 1.0, CHCl₃) Uv λ_{max} (EtOH) nm (ϵ): 238 (10,050), 288 (9880)

IR ν_{max} (nujol) cm⁻¹: 1762 (O–C=O), 1640 (C=O)

NMR δ_{H} (CDCl₃): 2.25 (2H, quartet, *J* = 7 Hz, O–CH₂–Me), 4.28 (2H, NH₂).

When the chemical shifts are shown with d, show the nuclei measured as δ_{H} , δ_{C} *etc.* When there is no chance of misunderstanding, d alone can be used.

ORD (*c* 0.118, MeOH)[α]³¹ (nm): –21° (589), –38° (400) X-ray $2\theta_{\text{Cu-K}\alpha}$: 18.8° (*d* = 4.72 Å), 20.5° (*d* = 3.65 Å) MS *m/z*: 154 (M⁺), 139 (M⁺ – CH₃).

Give the ionization conditions for CIMS, EIMS, FABMS, *etc.*

HRMS *m/z* (M⁺) Calcd. for C₂₉H₂₆O₁₀: 534.151. Found: 534.150.

Elemental analysis: Write as “Found: C, 70.01; H, 8.83; N, 3.68. Calcd. For C₂₂H₂₃O₄N: C, 70.36; H, 8.86; N, 3.73.”

In the descriptions of organic chemistry, pro-

vide either the results of elemental analysis of all novel compounds or high-resolution mass spectral data. In the descriptions of structural analysis, include the data on which the identification of the molecular structure was based (the results of elemental analysis and high-resolution mass spectral data). In the case of compounds for which a high-resolution mass spectrum cannot be created, include the data used for the calculation of the molecular weight. Such data must be omitted from Communications because of the restrictions on the word count. This data should be provided in a footnote.

15. Superscript and subscript

For superscripts and subscripts, use the word processor's functions.

16. DNA sequences

In papers describing newly sequenced DNA, the accession number and the database name (DDBJ, *etc.*) in which the sequence has been deposited must be provided. This information should be placed in parentheses at the first mention of the sequence in the abstract and text. Similarly, mention databases such as the PDB and CCDC in which new crystallographic data of atomic coordinates have been deposited.

Submission of manuscripts

Procedure for electronic submission to *Biosci. Biotechnol. Biochem.*

1. Prepare files and requisite information in advance. The PDF file of the manuscript and information of authors (For preparation, follow the instructions provided in "Guide for Submission (for non-Japanese authors).") Because the manner of using Electric Submission changes properly, it would be better to confirm "Guide for Submission" beforehand.
2. The entire manuscript, including the title page, abstract, figures, tables, *etc.*, must be submitted in a single PDF format.
3. The submitting author is requested to input or select following information.
 - a) Create account
Input the information of the corresponding author: name, affiliation, address, e-mail, and your membership number if you are a member of the Society. Do not forget to input the membership number. If the membership number is not inputted, the page charge will not be discounted because you will be treated as a non-member.
 - b) Submitting manuscript
 - 1) Select the type of paper, subject category, and classification of research fields (one or two).
 - 2) Input the title and running title.
 - 3) Check the box "Statement of originality" after reading the statement therein.
 - 4) Input abstract. The abstract should not exceed 150 words (Regular Paper), 100 words (Communication), or 60 words (Note).
 - 5) Input the numbers of the pages of text, figures, figure legends, and tables.

- 6) Input affiliation information. When two or more affiliations are to be inputted, press the "More" button; additional boxes will appear.
- 7) Input authors' information. If there are multiple authors, press "More" button. If any of the authors do not have an e-mail address, the e-mail address of the corresponding author may be placed instead.
- 8) Input key words. Press the "More" button if there are more than three key words.
- 9) Upload the manuscript file. Ensure that the "Upload" button is pressed after selecting the manuscript file. Upload the covering letter.
- 10) If the title, running title, abstract, or key words contain special characters such as α , β , italic letters, and superscripts, go to the page of "J-STAGE character entity references" by clicking on the link that is available on the top of each page.
- 11) If References include a paper in press or another manuscript related to the manuscript to be submitted is under submission, upload its file as a covering letter.

Procedures during publication

1. After the accepted manuscript has been returned from English editing, a complete retyped manuscript (title page, text, reference list, tables, figure legends, and figures) should be sent to the Society. When high resolution photographs cannot be submitted online, mailing is accepted. In this case, the author should contact the secretariat and thereafter the instructions will be followed.
2. The corresponding author will receive a galley proof for one revision. Only printing errors and page numbers of those articles that were in press but have been published now should be corrected. Any other additions and deletions are not permitted. In certain cases, with the permission of the Editor-in-charge, a short addition may be made in the form of a "Note Added in Proof." In that case, the additional cost will be borne by the authors.
3. If the galley proof is not returned before the deadline, the paper may not be printed.
4. Page charges and the price of reprints are as listed in the table below. The member fee is applied to a manuscript whose corresponding author has completed membership registration by submission and has provided his/her membership number. The actual expenses for the color print are to be paid by the author.
5. The offprints are sold in units of 50. They should be ordered on the order sheet provided by the Society. Return the order with the galley proof.
6. If an important error is discovered after publication, it should be brought to the attention of the editorial section so that an erratum can be published. If the error was made by the author, the costs of publication of the erratum will be charged to the author.

Page Charges and Price of Reprints

I. Page Charges (standard)

1) Regular Papers and Notes

Member of JSBBA	
Printed pages	JPY¥
1	4,200
2	8,400
3	12,600
4	16,800
5	21,000
6	25,200
7	29,400
8	33,600
9	37,800
10	42,000
11	46,200
12	50,400
13	54,600
14	58,800

Non-member	
Printed pages	JPY¥
1	8,400
2	16,800
3	25,200
4	33,600
5	42,000
6	50,400
7	58,800
8	67,200
9	75,600
10	84,000
11	92,400
12	100,800
13	109,200
14	117,600

2) Communications

Member of JSBBA	
Printed pages	JPY¥
1	8,400
2	16,800
3	25,200
4	33,600
5	42,000
6	50,400

Non-member	
Printed pages	JPY¥
1	16,800
2	33,600
3	50,400
4	67,200
5	84,000
6	100,800

3) Color Printing: Add JPY¥50,000 per a color page

4) Supplementary Materials

Add JPY¥4,200 per one file (Member of JSBBA)

JPY¥8,400 per one file (Non-member)

II. Price of Reprints (Postage is not included)

Printed pages	Copies					
	50	100	150	200	250	300
1-2	JPY¥3,780	JPY¥5,040	JPY¥7,560	JPY¥10,080	JPY¥12,600	JPY¥15,120
3-4	7,560	10,080	15,120	20,160	25,200	30,240
5-6	11,340	15,120	22,680	30,240	37,800	45,360
7-8	15,120	20,160	30,240	40,320	50,400	60,480
9-10	18,900	25,200	37,800	50,400	63,000	75,600
11-12	22,680	30,240	45,360	60,480	75,600	90,720
13-14	26,460	35,280	52,920	70,560	88,200	105,840

It is possible to pay Publishing Fee by credit card. Corresponding author will be able to choose the way for payment, when author gets galley proof.

Table 1. Units and Their Abbreviations

I. Prefixes of SI units					
exa	10 ¹⁸	E	coulomb	C	
peta	10 ¹⁵	P	farad	F	
tera	10 ¹²	T	ohm	Ω	
giga	10 ⁹	G	siemens (Ω^{-1})	S (mS, μ S)	
mega	10 ⁶	M	volt	V	
kilo	10 ³	k	watt	W	
hecto	10 ²	h	gauss	G (= 10 ⁻⁴ T)	
deca	10 ¹	da	tesla	T	
deci	10 ⁻¹	d	weber	Wb	
centi	10 ⁻²	c	(12) Revolutions and frequency		
milli	10 ⁻³	m	revolutions per minute	rpm	
micro	10 ⁻⁶	μ	hertz	Hz (MHz, kHz)	
nano	10 ⁻⁹	n	(13) Angles		
pico	10 ⁻¹²	p	degree	°	
femto	10 ⁻¹⁵	f	steradian	sr	
atto	10 ⁻¹⁸	a	(14) Radioactivity		
			becquerel	Bq (= 1 dps or 60 dpm ≈ 2.7 × 10 ⁻¹¹ curie)	
			counts per minute	cpm	
			(15) Enzymology		
			katal	kat	
II. Unit name and abbreviations			III. Other		
(1) Units of length			absorbance	<i>A</i> (<i>A</i> ₂₆₀), OD, OD ₂₆₀)	
meter	m (km, cm, mm, μ m, nm)		absorption coefficient	<i>E</i>	
angstrom (0.1 nm)	Å		base pair	bp	
(2) Units of area and volume			boiling point	bp	
square meter	m ² (km ² , cm ² , mm ² , μ m ² , nm ²)		concentration	<i>c</i>	
cubic meter	m ³ (km ³ , cm ³ , mm ³ , μ m ³ , nm ³)		density	ρ	
liter	l (kl, ml, μ l [not λ], nl) (Note: spell out 'liter' in full if there is any chance it may be misread as the numeral 'l')		diffusion constant	<i>D</i>	
(3) Units of mass			dissociation constant	<i>K</i> _d	
gram	g (kg, mg, μ g [not γ], ng)		enthalpy	<i>H</i> (change, ΔH)	
dalton	Da		entropy	<i>S</i> (change, ΔS)	
(4) Amounts of substances			equilibrium constant	<i>K</i>	
mole	mol (mmol, μ mol, nmol, pmol)		50% effective dose	ED ₅₀	
equivalent	eq		50% lethal dose	LD ₅₀	
(5) Concentration			freezing point	fp	
molar (moles/liter)	M (mM, μ M, nM, pM)		Gibbs free energy	<i>G</i> (change, ΔG)	
normal	N		gravities	<i>g</i>	
per cent	%		isoelectric point	pI	
weight concentration	kg/m ³ , g/ml, g/100 ml, etc.		logarithm	log	
parts per million	ppm		logarithm (natural)	ln	
parts per billion	ppb		maximum velocity	<i>V</i> _{max}	
parts per trillion	ppt		melting point	mp	
(6) Units of time			melting temperature	<i>T</i> _m	
second	s		Michaelis constant	<i>K</i> _m	
minute	min		molar absorption coefficient	ϵ	
hour	h		negative logarithm of hydrogen ion concentration	pH	
day	d		negative logarithm of acid dissociation constant	p <i>K</i> _a	
(7) Temperature			optical density	OD (OD ₂₆₀)	
degree Celsius	°C		partial specific volume	<i>v</i>	
kelvin	K		rate of flow	<i>R</i> _f	
(8) Energy			refractive index	<i>n</i> (<i>n</i> _D)	
joule	J (kJ)		relative molecular mass (molecular weight)	<i>M</i> _r (dimensionless)	
calorie	cal (kcal)		retention time	<i>t</i> _R	
erg	erg		sedimentation coefficient	<i>s</i>	
electronvolt	eV		sedimentation coefficient in water at 20°C, extrapolated to zero concentration	<i>s</i> _{20,w}	
(9) Force			specific rotation	[α]($[\alpha]$ _D)	
newton	N		standard deviation	SD	
(10) Pressure			wave number	cm ⁻¹	
atmosphere	atm				
bar	bar (mbar)				
pascal	Pa				
torr	kg/cm ² mm Hg				
(11) Electricity and magnetism					
ampere	A (mA)				

(ii)

Table 2. Abbreviations for Some Chemical Compounds

Amino acid residues		Guanosine	G
Alanine	Ala (A)	Inosine	I
Arginine	Arg (R)	Pseudouridine	ψ
Asparagine	Asn (N)	Ribosylthymine	T
Aspartic acid	Asp (D)	Thymidine (2'-deoxyribosylthymide)	dT
Aspartic acid or asparagine	Asx (B)	Uridine	U
Cysteine	Cys (C)	Adenosine 5'-mono, di, triphosphate	AMP, ADP, ATP
Glutamic acid	Glu (E)	Cyclic AMP, <i>etc.</i>	cAMP, cGMP, <i>etc.</i>
Glutamine	Gln (Q)	Cytidine 5'-mono, di, triphosphate	CMP, CDP, CTP
Glutamic acid or glutamine	Glx (Z)	Thymidine 5'-mono, di, triphosphate	dTMP, dTDP, dTTP
Glycine	Gly (G)	Guanosine 5'-mono, di, triphosphate	GMP, GDP, GTP
Half-cystine	Cys	Inosine 5'-mono, di, triphosphate	IMP, IDP, ITP
Histidine	His (H)	Ribosylthymine 5'-mono, di, triphosphate	TMP, TDP, TTP
Hydroxylysine	Hyl	Uridine 5'-mono, di, triphosphate	UMP, UDP, UTP
Hydroxyproline	Hyp	Complementary DNA (RNA)	cDNA (cRNA)
Isoleucine	Ile (I)	Heterogeneous nuclear RNA	hnRNA
Leucine	Leu (L)	Messenger RNA	mRNA
Lysine	Lys (K)	Mitochondrial DNA (RNA)	mtDNA (mtRNA)
Methionine	Met (M)	Nuclear DNA (RNA)	nDNA (nRNA)
Ornithine	Orn	Ribosomal RNA	rRNA
Phenylalanine	Phe (F)	Transfer RNA	tRNA
Proline	Pro (P)		
Pyroglutamic acid	<Glu	Other	
Serine	Ser (S)	Adenosine triphosphatase, <i>etc.</i>	ATPase, <i>etc.</i>
Threonine	Thr (T)	Coenzyme A	CoA (or CoASH)
Tryptophan	Trp (W)	Acyl coenzyme A	acyl-CoA
Tyrosine	Tyr (Y)	<i>O</i> -(Carboxymethyl) cellulose	CM-cellulose
Valine	Val (V)	<i>O</i> -(Diethylaminoethyl) cellulose	DEAE-cellulose
		Ethylenediaminetetraacetate	EDTA
Sugars		Flavin-adenine dinucleotide (reduced form)	FAD (FADH ₂)
<i>N</i> -Acetylglucosamine	GlcNAc	Flavin mononucleotide (reduced form)	FMN (FMNH ₂)
<i>N</i> -Acetylneuraminic acid	NeuAc	Glutathione (oxidized form)	GSH (GSSG)
Arabinose	Ara	Hemoglobin (oxyhemoglobin)	Hb (HbO ₂)
2-Deoxyglucose	dGlc	4-(2-Hydroxyethyl)-1-piperazineethane sulfonic acid	Hepes (HEPES)
Fructose	Fru	Immunoglobulin	Ig (IgG, IgM, <i>etc.</i>)
Galactose	Gal	Trimethylsilyl	Me ₃ Si
Glucosamine	GlcN	Tetramethylsilane	Me ₄ Si, TMS
Glucose	Glc	Nicotinamide-adenine dinucleotide and its oxidized and reduced forms	NAD, NAD ⁺ , NADH
Mannose	Man	Nicotinamide-adenine dinucleotide phosphate and its oxidized and reduced forms	NADP, NADP ⁺ , NADPH
Ribose	Rib	Inorganic phosphate	P _i
UDP-galactose	UDP-Gal	Inorganic pyrophosphate	PP _i
UDP-glucose	UDP-Glc	Sodium dodecyl sulfate	SDS
Xylose	Xyl	Tris(hydroxymethyl)aminomethane	Tris
Nucleic acids			
Adenosine	A		
Cytidine	C		