

From The DOE Deliverables Guidelines

Preparing the Research Report Paper

The main text of the paper is to be between 1500 and 3000 words. The word count does not include footnotes, appendices, the bibliography and similar items. All appendices together must be three pages or less. The form of the paper should follow the guidelines of the appropriate portions of the [Style Manual from the American Institute of Physics](#). The final paper that you submit should be in "publication" form. Submission must be made using the WARS online system, as an Adobe Acrobat (.pdf) file, prior to the end of their appointment and as directed by the host laboratory. Host institutions will provide submission system relevant instructions and may also provide additional related resources and guidance.

The instructions for preparing the research report paper contain, or follow, revised and/or excerpted elements from the American Institute of Physics (AIP) Style Manual (4th edition, 1990).

Because your paper will not, in general, be written for AIP publication, some parts of the full AIP Style Manual are not relevant to or important for your assignment. In the revised and/or excerpted version here, this unneeded material has been removed.

I. General instructions

(1) Submit manuscripts in English only (American spelling). If you are not fluent in English, ask a colleague who is to read and correct your manuscript.

(2) Indent paragraphs, so that the start of a new paragraph is clearly distinguished from the continuation of an existing one after a displayed equation.

(3) Number all pages in sequence, beginning with the title and abstract page.

(4) Use a minimum 12 point font.

II. Title

(1) Place the title about a third of the way down from the top of the first page.

(2) Begin the first word with a capital letter; thereafter capitalize only proper names and acronyms.

III. Abstract

(1) Begin the abstract on a new line.

(2) Use wider side margins for the abstract than for the rest of the manuscript, so that it will be clear where the abstract ends and the main text begins.

(3) Type or print the abstract double spaced, preferably as one paragraph of continuous text. Avoid displayed mathematical expressions, figures, and tables.

(4) If a reference to the literature is needed, write it out within square brackets in the text of the abstract rather than referring to the list at the end of the paper. For example: The measurement of hydrogen permeation into iron reported by W. R. Wampler [J. Appl. Phys. 65, 4040 (1989)], who used a new method based on ion beam analysis,...

(5) Define all nonstandard symbols, abbreviations, and acronyms.

IV. Section headings

(1) Write principal headings in all capital letters and lower-level headings with an initial capital letter to the first word only, as shown in Table I.

(2) If headings are numbered or lettered, use the scheme indicated in Table 1: roman numbers, capital letters, Arabic numerals, and lower-case letters in that sequence for the four levels of heading. Number or letter consecutively through the text.

TABLE I. The four levels of section headings in the body of a manuscript.

As printed in most journals

I. PRINCIPAL HEADING

A. First subheading

1. *Second subheading*

a. *Third subheading*. Followed immediately, on the same line, by text.

V. Acknowledgments

(1) The acknowledgments section follows the main text of the paper and precedes any appendixes and the list of references.

(2) It is recommended that this section be given a principal heading ("ACKNOWLEDGMENTS"), but if there is only one acknowledgment the singular form may be used.

VI. Appendixes

(1) Appendixes follow the acknowledgments and precede the list of references.

(2) Headings to appendixes have the form of principal headings. If there are two or more appendixes, they can be labeled A, B, C, etc. Examples:

APPENDIX

APPENDIX: CALCULATION OF

F(t) APPENDIX A

APPENDIX C: PROOF OF THE EQUIVALENCE THEOREM

VII. Footnotes and references

(1) Type or print each footnote as a separate indented paragraph beginning with the appropriate superscript indicator.

(2) For references cited in the text use superscript numerals running consecutively through the text: 1, 2, 3, etc. Place citation indicators after commas, periods, quotation marks, colons, and semicolons:

As pointed out by Bray,⁶ these calculations are in agreement with other experimental values.^{7,8}

We obtained the following values for the two parameters:¹³⁻¹⁵ $l = 0.775$ and $r_0 = 0.590$.

Do not put citation indicators where they might be mistaken for numbers with a different meaning. Write:

A recent measurement² of Δv ...

instead of

A recent measurement of Δv^2 ...

(3) In text, refer to authors by last name (surname, family name) only. In the references themselves, give authors' names in the form in which they appear on the title page of the cited work. For names in the west European tradition, retain the order that puts the family name last (for example, John J. Doe, not Doe, John J.).

(4) For the recommended form and content of bibliographic references see Table II.

In journal references, give the volume number, the article title, the inclusive page numbers (first and last), and the year of publication.

Include the issue when the journal is not paginated consecutively through the volume (for example, *Physics Today*, *Scientific American*). Give the year in place of the volume number only when the journal does not use volume numbers. References to errata should be labeled as such, as should

references to "abstract only" or "title only" publications.

In book references always include the title, the authors' or editors' names, the publisher's name and location, and the year of publication. References to laboratory reports should not contain abbreviations or acronyms for the names of laboratories or agencies; spell them out.

The use of the expression "*et al.*" (as in "Jones *et al.*⁸ studied this reaction in 1982") is encouraged in the body of the paper, but discouraged in the references unless there are more than three authors' names.

"In press" or "to be published" means that the paper has been accepted for publication in a journal, and the title of the journal must be given. Such a reference may be updated at the proof stage if the referenced paper has been published by then.

(5) Refer to the original sources whenever possible as you gather details for bibliographic references. Do not rely on intermediate citations, which may contain misspelled names or erroneous volume and page numbers and publication dates.

(6) Avoid references to unpublished material that is difficult or impossible to obtain.

(7) For footnotes to tables, see point (8) of the next section.

VIII. Tables

(1) Tabular material more than four or five lines long should be presented as a numbered table with a caption and not included as part of the running text.

(2) Type or print each table double spaced on a separate page after the references and before the figure captions. Place the table caption directly above the table to which it belongs, not on a separate sheet. See Table III for an example.

(3) Number the tables in the order of appearance in the text, and make sure each table is cited in text. Tables displayed and cited in proper sequence in the main body of the paper may be mentioned out of sequence in the introduction.

(4) Give every table a caption that is complete and intelligible in itself without reference to the text.

(5) Give every column a heading. Make it clear and concise. Capitalize the first word of a heading unless it is a standard abbreviation that is always used lower-case.

Units of measurement should be placed in parentheses on the line below the appropriate heading. Choose units so that entries are near unity in magnitude, so that, as far as possible, powers of ten are not needed for most entries.

(6) Align columns of related numbers by decimal. Do not use "ditto" or any symbol such as

quotation marks to indicate repeated entries; write each entry out in full. Use raised dots ("") instead of dashes to indicate missing values.

(7) Type or print a double horizontal line below the table caption, a single line below column headings, and another double line at the end of the table. Avoid vertical lines between columns: use appropriate spacing instead.

(8) Footnotes to a table are indicated by a sequence of lower-case letters ^a, ^b, ^c, etc., with a new sequence starting with ^a for each table. The ordering of footnote indicators should be left to right across one row, and then left to right across the next row, and so on. Place the footnotes themselves below the double line at the end of the table.

TABLE II. Examples of footnotes

Kind of footnote	As typed in paper
Journal article citations	¹ Gale Young and R. E. Funderlic, "Positron decay in Na," J. Appl. Phys. 44, 5151-5153 (1973).
Issue number included	² M. D. Levinson, "Rate of decay of auditory sensation," Phys. Today 30 (5), 44-49 (1977).
Book reference	³ L. S. Berks, <i>Electron Probe Microanalysis</i> , 2nd ed. (Wiley, New York, 1971), p. 40. ⁴ D. K. Edwards, in <i>Proceedings of the 1972 Heat Transfer Institute</i> , edited by R. B. Landis (Stanford University, Stanford, CA, 1972), pp. 71-72.
Referenc to unpublished work	⁵ R. C. Mikkelson (private communication).

(9) In designing a large table, take into account the size of the journal page on which it is to be printed. Tables may be continued onto a second page or beyond, in which case the column headings will be repeated. Tables may also be turned 90° from the usual orientation.

IX. Figures and figure captions

Figures play a significant role in the expression of scientific ideas. A single well-prepared figure can contribute immeasurably to the clarity of the text, and high standards of presentation are therefore particularly important.

(1) Number figures in order of their appearance in the text and make sure that every figure is

cited. Figures displayed and cited in proper sequence in the main body of the paper may be mentioned out of sequence in the introduction.

- (2) Every figure must have a caption that is complete and intelligible in itself without reference to the text. Type each caption as one paragraph, beginning with the figure number in the form:

FIG. 1. Variation of distance R with...

In captions, use symbols to represent data points, but use words to identify curves (for example, "solid," "dashed," "dotted," "dot-dashed," etc.). A better alternative is to label curves with letters (A, B, etc.) and to refer to them by letter in the caption ("Curve A represents...").

- (3) Figures can be in color when necessary, and where the color adds scientific information not clearly available in an equivalent monochrome version.
- (4) Graphs should be self-explanatory, their purpose evident without reference to the text. Indicate clearly what is being plotted, in both the horizontal and the vertical directions. Include appropriate units. Orient letters and numbers so that they may be easily read from the bottom or the right-hand side of the graph. Relevant nongraphic material, such as the key to the symbolism in the graph, may be included within the confines of the graph frame if it will fit without crowding; otherwise put the explanatory material in the caption.

The notation used in graphs should be standard and consistent with the notation used in the text.

Write 0.1, not .1, 0 1, or 0,1. Do not capitalize letters indiscriminately:

write in units of q/a , not IN UNITS OF q/a

And kinetic energy $E_f(\text{meV})$ not KINETIC ENERGY $E_f(\text{MEV})$

Take care to preserve standard forms for symbols and abbreviations, as you would in text.

Standard units should be well spaced off and enclosed in parentheses.

If possible, do not use powers of ten in axis labels: use instead the appropriate prefixes of the *Systeme International* (see Table IV). If powers of ten must be used, write for

example $R(10^{-4}[\text{Omega}])$ or $10^4 R ([\text{Omega}])$.

Never write

$R \times 10^{-4}[\text{Omega}]$ or $R / 10^{-4}[\text{Omega}]$,

because in these forms it is not clear whether the scale numbers have been or are to be multiplied by 10^{-4} . Better still; attach the power of ten to the largest number on the axis: 8×10^{-4} .

Whenever possible, use integer numbers on the axis scales of figures (1, 2, 3, or 0, 5, 10, not 1.58, 3.16, 4.75 or 1.5, 3.0, 4.5). If this is not feasible, then there must be a number both before and after the decimal point: Use 0.5, not .5, and 5, not 5., etc. Do not use unnecessary decimal places: 1.0, 1.5, 2.0 is acceptable, but not 1.00, 2.00, 3.00.

Coordinate ruling should be limited in number to those necessary to guide the eye in making a reading to the desired degree of approximation. Ticks to indicate coordinate values, placed within all four sides of the graph, increase readability, and are recommended. Closely spaced coordinate rulings are appropriate only for computation charts. It is often impossible in a journal to make a graph large enough to preserve accuracy of the data beyond two significant figures. If that accuracy is not sufficient for your purposes, present the data as a table.

Graphs with large blank areas, or large areas containing only nongraphic material, are unacceptable; use only the ranges of coordinates for which there are data. If similar quantities are plotted several times, use shifted ordinate scales for each plot and enclose the plots in one large rectangle, not in separate boxes, thereby saving space. Isometric drawings giving the illusion of three dimensions to the family of curves are often better.

- (5) In diagrams of electrical circuits, the values of resistances, inductances, etc. and component designations should be lettered directly on the diagram. A separate parts list in the caption is then unnecessary, except for special or unusual components.

X. Mathematical expressions and equations

Display all numbered and complicated unnumbered equations on separate lines set off from the text above and below. "Complicated" equations are equations hard to accommodate within running text. These include equations longer than about 25 characters.

- (1) Equation numbers:

- (a) Only displayed equations may be numbered.

- (b) The preferred style is to number equations consecutively throughout the text with Arabic numerals in parentheses: (1), (2), (3), etc. Numbering by section is also acceptable, if the section number is made part of the equation number: (2.1), (2.2), (2.3), etc. In appendixes

use the numbering sequence (A1), (A2), (A3), etc.

(c) Place equation numbers flush with the right margin. Leave a space at least two characters wide between an equation and its number.

(d) An equation number should be centered beside a group of equations identified by one number, as in Eqs. (2), (6), and (7) on this page. It should be aligned with the last line of a multilinear equation, as in Eqs. (3)- (5).

(2) Roman versus italic type:

(a) According to conventional practice, Latin letters used as mathematical symbols are set in italic type to distinguish them from ordinary roman text...

(b) Boldface is used for three-vectors, dyadics, some matrices, tensors without indices, etc. It is inappropriate for four-vectors (k), vectors represented by a typical component, such as x_i for $x = (x_1, x_2, x_3)$, and the magnitude of a vector, H for \mathbf{H} . Subscripts attached to a three-vector should not be boldface unless they would be so as main characters.

(c) When it is essential to distinguish between vectors and tensors, sans serif may be used for tensors.