

16 Conventions Used in Scientific and Technical Writing

This chapter covers conventions for the following:

- Where to place the titles of figures and tables
 - Using numbers
 - Numbering of illustrations, sections, pages, appendices, equations
 - Writing numbers in the text
 - Referring in the text to figures, tables, chapters, table rows or columns, pages
 - Equations: formatting in the text
 - Written style for headings
 - SI units
 - Genus and species names
 - Checklists
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Obeying the conventions may sound tedious. However, there are many standard conventions of scientific writing and to maximise your marks for a report, you'll need to use them. Staff assessors will expect these conventions to be used and are likely to mark you down if you don't. It will be particularly important for a major report in the later years of your degree.

This chapter is a collection of the main conventions used. Some of them are also briefly referred to at the appropriate part of the various chapters.

Where to Place the Titles of Tables and Figures

The table number and title is placed *above* a table.

The figure number and title is placed *below* a figure.

This is just one of those strange conventions. However, some graphing programs don't conform with it.

Common mistake

Table headings placed under the table.

Using Numbers

Numbering of Illustrations, sections, pages, appendices and equations

Numbering of illustrations

- Every illustration (figure or table) in a document *must* have the following:
 - A number
 - A title
 - And be referred to at an appropriate place in the text. See **Illustrations** Chapter 2, page 44, *The Core Chapter*, for other information about requirements.
- There should be two numbering series for illustrations:
 1. **One for all the figures**, i.e. everything that isn't a table – graphs, maps, line drawings, schematics, etc.
 2. **Another series for the tables.**This means that there will be Figure 1, Figure 2... etc., **and** Table 1, Table 2... etc.

Conventions for figure numbering

All your figures – this includes graphs, line drawings, maps, photographs and other types of illustrations – should be labelled as one series. Each one of the series is then labelled Figure 1, Figure 2, etc.

Example: If the first of your illustrations is a map, the second a graph and the third a line drawing, call the map Figure 1, the graph Figure 2 and the line drawing Figure 3.

Common mistake

To distinguish between the different types of illustrations and to call your graphs Graph 1, Graph 2..., your maps Map 1, Map 2... and your line drawings Figure 1, Figure 2....

Variation on This: Numbering According to the Section Number

When your report has numbered sections (see *Numbering of Sections*, page 193), your illustrations can be numbered according to the section numbers:

First illustration	A map in Section 2	Figure 2.1
Second illustration	A graph in Section 2	Figure 2.2
Third illustration	A line drawing in Section 4	Figure 4.1
Fourth illustration	A graph in Section 5	Figure 5.1

Do not try to number your illustrations according to the sub-section number. You will end up with figure numbers such as Figure 3.1.2.1 (the first figure in

Section 3.1.2), which is clumsy and confusing. Number them in accordance with the main section only.

Table numbers

The numbering series for your tables is completely independent of the series for your figures.

Number each table Table 1, Table 2... in sequence.

Variation on this

In the same way as for figures, tables can be numbered according to the section of your report in which they occur.

First table	The first one in Section 2	Table 2.1
Second table	The second one in Section 2	Table 2.2
Third table	The first one in Section 5	Table 5.1

Numbering and captions of tables and figures in the *appendices*

Tables and figures in *Appendices* do not belong to the two series in the main body of the document. They are labelled as two separate series in their own right, according to the numbering of the Appendix.

Figure 1-1 (Figure 1 in Appendix 1), Figure 1-2 (Figure 2 in Appendix 1) etc.

or

Figure A-1 (Figure 1 in Appendix A), Figure A-2 (Figure 2 in Appendix A) etc.

or

Figure 2, Appendix 1, etc.

Numbering of sections of a report

This section describes the conventions for the decimal point numbering system for numbering sections of a document, and their associated sub-headings and sub-sub-headings.

The main sections are given Arabic numerals. The sub-sections are shown by putting a decimal point after the section number and another Arabic numeral:

- 1.0 Title of first main section
 - 1.1 First sub-heading
 - 1.2 Second sub-heading
- 2.0 Title of second main section
 - 2.1 First sub-heading
 - 2.2 Second sub-heading
 - 2.2.1 First division in the second sub-heading
 - 2.2.2 Second division in the second sub-heading
 - 2.2.3 Third division in the second sub-heading
 - 2.3 Third sub-heading
- 3.0 Title of third main section

For the formatting conventions of a *Contents Page*, see *Table of Contents*, Chapter 2, *The Core Chapter*, page 23.

Numbering of pages

The conventions associated with page numbering in a document are the following:

- All of the preliminary pages, i.e. those before the *Introduction* (*Title page*, *Abstract*, *Acknowledgements*, *Table of Contents*, *List of Illustrations*, *Glossary of Terms and Abbreviations*, etc.) are assigned lowercase Roman numerals (i, ii, iii, iv, v, etc.).
- The first page that is counted is the Title Page, but it is not labelled as such; it is left blank.
- Each of the other preliminary pages (starting at page ii) is labelled with its number.
- Page 1 is the first page of the *Introduction*.
- After page 1, the page numbering is continuous.

Any large scientific document such as a thesis or a major report will be expected to conform to this numbering system.

Common mistake

To number the *Abstract* page as page 1 and continue from there.

Numbering of appendices

Appendices can be named either:

Appendix 1, Appendix 2, Appendix 3, etc.

or

Appendix A, Appendix B, Appendix C, etc.

The page numbers of the *Appendices* are usually separate from those of the main body of the document and are related to the numbering of the *Appendix*. For example:

Page 1-1, 1-2, 1-3 etc. *or* page A-1, A-2, A-3 etc.

However, word processors can be uncooperative in producing this sort of numbering, so many assessors might accept a serial numbering for all of the appendix pages, or even a continuation of the page numbering of the main body of the report. Check with the assessor.

Numbering of equations

Equations should be numbered consecutively throughout the report, either as a continuous series (1, 2, 3, 4, etc.) or be related to the section number (e.g. Equation 3.2 would be Equation 2 in Section 3 of the report, etc.).

Writing numbers in the text

These are the conventions for dealing with numbers in scientific and technical writing:

Summary Table

Numbers	Rule/Convention	Example
Measured quantities	Figures	6 tonnes, 3 amps
Counted numbers One to ten More than ten	Words Figures	... in five areas ... in 11 areas
Number at the beginning of a sentence	Words	Eleven samples were taken.
Ordinal numbers	Same as for counted numbers (above)	(first, second, third... 11th...)
A series of numbers above and below 10	Figures	... over periods of 3, 6 and 12 hours
Percentages	Figures	... that 8% of the samples...
Fractions	Words	... one-fifth of the bait was taken (<i>but better expressed as a percentage</i>)
Dates and times	Figures	... on 8 October ... at 8.30 am (or 08:30)
Reference in the text to figures and tables	Figures	Figure 3 shows that... ... (Table 2)

Referring in the Text to Figures, Tables, Chapters, Rows or Columns of Tables, Pages

Figures, tables, chapters, sections	Use initial capitals when referring to specific figures, tables, chapters or sections.	<i>Examples</i> ... is shown in Figure 3. ... as given in Table 2. ... is described in Chapter 6. ... is analysed in Section 5.
Rows or columns of tables, pages	Do not use initial capitals when referring to rows or columns of tables, or to pages.	... as given in row 2 of Table 12. ... as given in column 3 of Table 12. ... is given in Section 4, pages 38–41.

Equations: Formatting in the Text

Equations should be centred with the equation numbers in round brackets and right justified (see above for equation numbering). Leave about one line of space both above and below the equation. For instance:

$$y = ax + \cos x + \beta \quad (1)$$

There are minor variations in styles of formatting equations. The following shows a good general style:

Notes	Text of the document
Equation is centred	The value of the shear stress at a distance r from the axis is given by $\tau = Gr \frac{d\phi}{dx} \qquad (3.5)$ Eq. (3.5) shows that the shear stress acting on the circular cross-section is linear in the radius r .
Equation number in brackets is tabbed to the right margin. This is equation number 5 in Section 3 of the report.	
In the text refer to the equation as either ‘Eq. (<i>equation number</i>)’ or ‘equation (<i>equation number</i>)’. Be consistent in your use of one or the other throughout your text.	

For a sequence of equations in which the left-hand side is unchanged.

Align the = symbol in each line.

$$\begin{aligned} u(x) &= -\frac{q_0}{AE} \int_0^x (x - \xi) d\xi + \frac{C_1 x}{AE} \\ &= -\frac{q_0 x^2}{2AE} + \frac{C_1 x}{AE} \end{aligned}$$

For continued expressions in which the left side is long.

Align the = symbol with the first operator in the first line.

$$\begin{aligned} &[(a_1 + ia_2) + (a_{11}s_1 + a_{21}s_2)] / [(b_1 + ib_2) + (b_{11}s_1 + b_{21}s_2)] \\ &= f(x)g(y) + \dots \end{aligned}$$

For expressions in which the right-hand side is long: Align the continuing operator with the first term to the right of the = symbol.

$$\begin{aligned} V(x) &= -P\langle x \rangle^0 + P(x - a)^0 \\ &\quad + P\langle x - (L - a) \rangle^0 - P\langle x - L \rangle^0 + C_1 \end{aligned}$$

Built-up fractions should be avoided in text. Instead, use solidus fractions $1/(x + y)$.

Written Style for Headings

Headings and Sub-Headings of Sections in the Text and the Table of Contents

Initial capitals can be used to distinguish between the different levels of headings.
For example:

Top level headings use the format known as Title Case (main words are capitalised):

Example: **Results and Discussion**

Next heading level down: sentence case (first word is capitalised):

Example: **Implementation of scheduling**

General convention: Capitalise the initial letters of the ‘main’ words in the titles, i.e. the words other than small words such as articles, prepositions and conjunctions (Table 16.1).

Table 16.1 Common Words That Do Not Have Initial Capitals, Unless They are the First Word in the Title	
Articles	the a
Prepositions	across by for to up down of
Conjunctions	and but so since because for although
Coordinators	if...then both...and either...or neither...nor whether...or

Use of SI Units

The International System of Units (SI) should always be used throughout scientific and technical documents. If you don’t do this, or if you use a mixture of units, your reports are likely to be severely penalised.

The SI units most commonly used in student scientific and technical reports are given in Appendix 1, *SI Units and Their Abbreviations*, page 257.

For greater detail, use the authoritative online source:

International System of Units (SI): <http://physics.nist.gov/cuu/Units/units.html>

Genus and Species Names

The conventions for the more simple aspects are given here. For further detail, use a style manual such as *Scientific Style and Format: The CSE Manual for Authors, Editors and Publishers*. 7th edition. Council of Science Editors, 2006.

The name of a species is in two parts, consisting of two Latin names: a genus name and a species epithet, e.g. *Panthera tigris*; *Rosa acicularis*.

Be aware that the conventions governing sub-species differ between zoology and botany.

- A zoological sub-species is in three parts: *Panthera tigris sumatrae*.
- A botanical sub-species requires 'ssp.' or 'subsp.' before the sub-specific name: *Rosa carolina* subsp. *subserrulata*.
- The initial letter of the genus name is capitalised.
- The initial letter of the species epithet is always written in lowercase.

Common mistake

To capitalise the species epithet, e.g. *Panthera Tigris*.

- The whole name is italicised (or underlined if you are writing by hand).
- A genus name should always be followed by a species epithet or, if the species is unknown, by 'species', 'sp' (singular) or 'spp' (plural), none of which are italicised, e.g. *Rosa* sp.
- A genus name should be spelled out on first mention in the text. Thereafter, it can be abbreviated to the initial letter followed by a full-stop and the species epithet, e.g. *P. tigris*; *R. carolina*.
- A variety is written as follows: *Rosa acicularis* var. *Alba*, or *R. acicularis* var. *Alba*.

Checklist

Make sure you use all of the relevant conventions consistently and correctly.